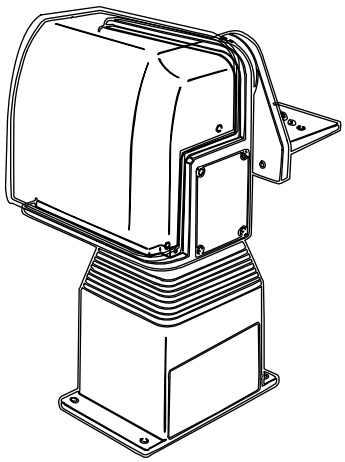
ORDER NO. BSD0009M908
D12

Service Manual

Sec. 1 *Operating Instructions*
Sec. 2 *Schematic Diagrams*
Sec. 3 *Circuit Board Diagrams*
Sec. 4 *Exploded Views & Parts List*

Indoor Pan / Tilt Head

AW-PH300AP/E



Panasonic

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Specifications

Source Voltage:
12 V DC (DC jack)
Power Consumption:
2.5 A (including camera power)
0.7 A (pan/tilt head only)

Genlock Input:
1.0 V [p-p], black burst or composite video, 75Ω
(BNC connector)
Camera Video Output:
1.0 V [p-p] composite video, 75Ω
(BNC connector)
Camera Control:
Two-way serial communication
(BNC connector)
Pan/tilt Control:
RS485 or equivalent (8-pin modular jack)
Pan/tilt Control:
RS-232C/contact signal (28-pin, half-pitch connector)
Lamp Control:
Control signal (terminals)
Option Control:
Control signal (terminals)
Maximum cable length:
500 m (In case of using coaxial cables 5C-2V and 10BASE-T sraight cable UPT category-5)
Maximum load:
4kg (maximum)
Operating temperature:
14°F to +113°F (–10°C to +45°C)
Operating humidity:
Less than 90%
Dimensions (W×H×D):
5 1/8″×9 5/8″×7 9/16″
(130×244×192 mm)
Weight:
7.7 lb (3.5 kg)
Finish:
AV Ivory painting (approximate color: Munsell 7.9Y 6.8/0.8)

■ Functions/Performance

Tilting Angle:
190° (approx. ±95°)
The tilt range may be less depending on the cable, lens, etc. of the camera mounted.
Panning Angle:
300° (approx. ±150°)
Maximum Speed:
Panning: 25°/sec, tilting: 20°/sec
Repeatability:
Less than ±5′
Noise Level:
Less than NC30

Weight and dimensions indicated are approximate.
Specifications are subject to change without notice.

SAFETY PRECAUTIONS

GENERAL GUIDELINES

1. When servicing, observe the original lead dress. If a short circuit is found, replace all parts which have been over-heated or damaged by the short circuit.
2. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers shields are properly installed.
3. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

LEAKAGE CURRENT COLD CHECK

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Measure the resistance value, with an ohm meter, between the jumpered AC plug and each exposed metallic cabinet part on the equipment such as screwheads, connectors, control shafts, etc. The resistance value must be more than 5MΩ.

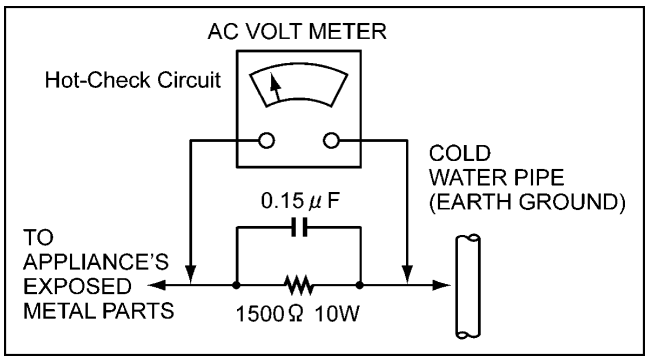


Figure1

LEAKAGE CURRENT HOT CHECK (See Figure 1)

1. Plug the AC cord directly into the AC outlet.
   Do not use an isolation transformer for this check.
2. Connect a 1.5kΩ, 10W resistor, in parallel with a 0.15μF capacitor, between each exposed metallic part on the set an a good earth ground such as a water pipe, as shown in Figure1.
3. Use an AC voltmeter, with 1000 ohms/volt or more sensitivity, to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the AC plug in the AC outlet repeat each of the above measurements.
6. The potential at any point should not exceed 0.15 volts RMS. A leakage current tester (Simpson Model 229 equivalent) may be used to make the hot checks, leakage current must not exceed 0.1 milliamp. In case a measurement is outside of the limits specified, there is a possibility of a shock hazard, and the equipment should be repaired and rechecked before it is returned to the customer.

ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically sensitive (ED) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground.
   Alternatively, obtain and wear a commercially available discharging wrist trap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as alminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it.
   (most replacement ES devices are package with leads electrically shorted together by conductive foam, alminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise hamless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

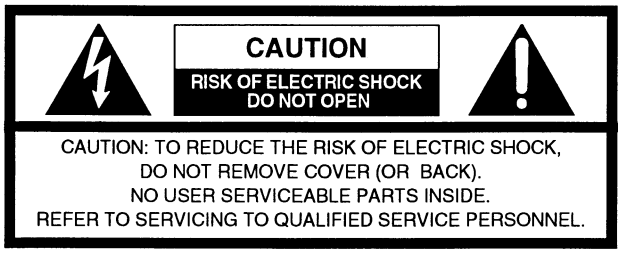
X-RADIATION

WARNING

1. The potential source of X-radiation in EVF sets is the High Voltage section and the picture tube.
2. When using a picture tube test jig for service, ensure that jig is capable of handling 10kV without causing X-Radiation.

Note : It is important to use an accurate periodically calibrated high voltage meter.

3. Measure the High Voltage. The meter (electric type) reading should indicate 2.5kV, ±0.15kV. If the meter indication is out of tolerance, immediate service and correction is required to prevent the possibility of premature component failure. To prevent an X-Radiation possibility, it is essential to use the specified picture tube.


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER SERVICEABLE PARTS INSIDE.
REFER TO SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (service) instructions in the literature accompanying the appliance.

CAUTION:

Do not install or place this unit in a bookcase, built-in cabinet or in another confined space in order to keep well ventilated condition. Ensure that curtains and any other materials do not obstruct the ventilation condition to prevent risk of electric shock or fire hazard due to overheating.

WARNING:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

CAUTION:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.

FCC Note:

This device complies with Part 15 of the FCC Rules. To assure continued compliance follow the attached installation instructions and do not make any unauthorized modifications.

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Replace battery with part No. VL3032/1GUF only.
Use of another battery may present a risk of fire or explosion.
Caution—Battery may explode if mistreated.
Do not recharge, disassemble or dispose of in fire.

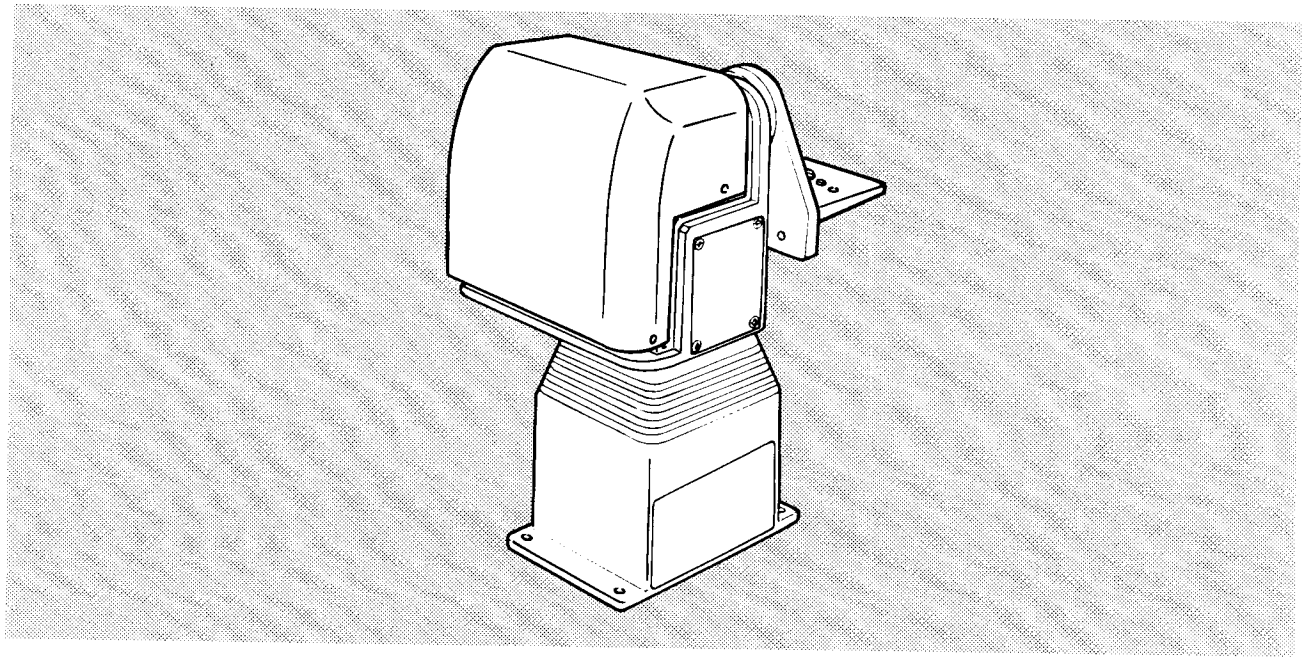
SECTION 1

OPERATING INSTRUCTIONS

Operating Instructions

Pan/Tilt Head

Model AW-PH300AP



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Before attempting to connect, operate or adjust this product, please read these instructions completely.

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER SERVICEABLE PARTS INSIDE.
REFER TO SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (service) instructions in the literature accompanying the appliance.

WARNING:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

CAUTION:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.

CAUTION:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, REFER CHANGE OF SWITCH SETTING INSIDE THE UNIT TO QUALIFIED SERVICE PERSONNEL.

▭ indicates safety information.

FCC Note:
This device complies with Part 15 of the FCC Rules. To assure continued compliance follow the attached installation instructions and do not make any unauthorized modifications.

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Replace battery with part No. CR2032 only.
Use of another battery may present a risk of fire or explosion.
Caution—Battery may explode if mistreated.
Do not recharge, disassemble or dispose of in fire.

indicates safety information.

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Features

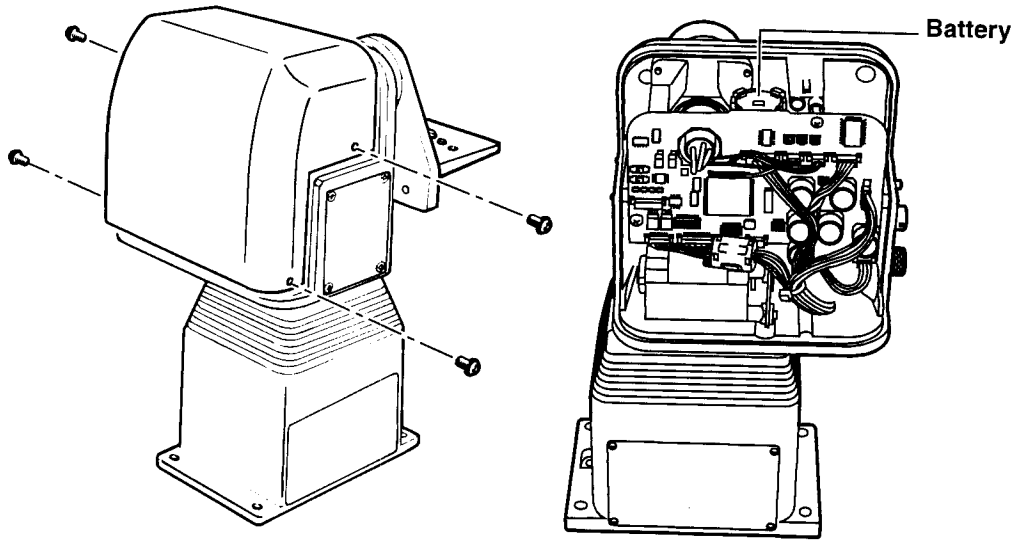
- This is a compact, mounting type of pan/tilt head which is capable of rotating 95 degrees upward, 95 degrees downward and 300 degrees on the horizontal.
- This pan/tilt head can bear a total weight up to 4 kilograms for both the camera and lens.
- The pan/tilt head can be controlled directly using the Pan/Tilt Control Panel (AW-RP301 or AW-RP305). (Simultaneous connection with RS-232C is possible. Control is not exercised over the camera.)
- The camera and pan/tilt head can be controlled directly using the Hybrid Control Panel (AW-RP501). (Simultaneous connection with RS-232C is possible.)
- When the Multi Hybrid Control Panel (AW-RP505) is used, up to five cameras and pan/tilt heads can be controlled directly via the Multiport Hub (AW-HB505).
- The pan/tilt head can be controlled from a PC, etc. using the RS-232C interface facility. (Simultaneous connection with a control panel is possible.)
- Up to 50 points can be preset when control is exercised using the RS-232C interface facility.
- The pan/tilt head can be controlled using a contact-type controller.

Accessories

Camera mounting plate 1
Camera mounting plate fixing screws (M4×10 mm) 2
Tilting arm 1
Tilting arm fixing screws (M4×12 mm) . . . 4

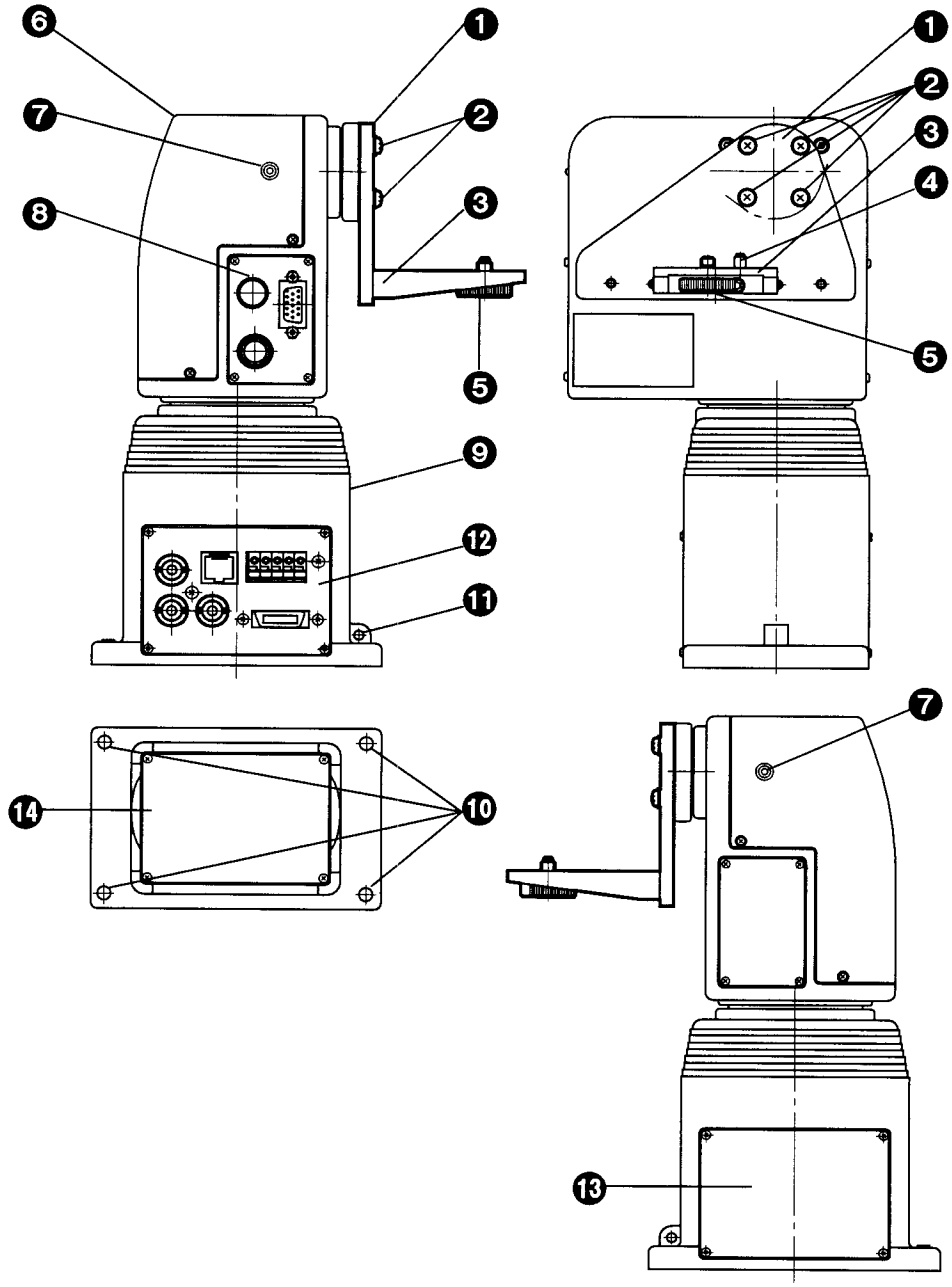
Precautions

The pan/tilt head uses a manganese dioxide lithium battery (CR2032).
Be sure to remove the battery before disposing of the pan/tilt head or the printed wiring boards in the head.
Be sure to dispose of a removed battery according to the applicable provisions of law.
Do not dispose of it as ordinary trash.
The battery is located as shown in the figure below. To remove the battery, refer to Battery Replacement under the Replacement of Expendables on page 26.



- Avoid using the pan/tilt head in the kitchen or other places full of steam and oil fumes.
- The pan/tilt head has a maximum load capacity of 4kg. Do not use it for a load over 4 kg.
- Do not install the pan/tilt head outdoors, or any place where the temperature is over 113°F (45°C) or below 14°F (–10°C).
  Ambient humidity must be less than 90%.
- Mounting screws must be locally purchased because they are not supplied.
  Choose screws appropriate to the material of the mounting place and the load on the pan/tilt head.
- Use only with AC Adaptor, Model AW-PS300.
- In handling the pan/tilt head, be sure to hold it by the base.
  Do not lift the pan/tilt head by the rotary part. Otherwise, something may go wrong with the head.
- Do not turn the pan/tilt head by the rotary part. Otherwise, something may go wrong with the head.
- Dropping the pan/tilt head or subjecting it to a strong shock can cause a malfunction or an accident.
- Keep the pan/tilt head more than 1 meter away from the monitors.

Controls and Their Functions



Controls and Their Functions

❶ Tilting Arm (supplied)
This arm tilts the head.

❷ Tilting Arm Fixing Screws (supplied)
4 screws are supplied to fasten the tilting arm.

❸ Camera Mounting Plate (supplied)
Used to fasten the camera.

❹ Camera Guide Pin
This pin sets the mounting direction of the camera.

❺ Camera Mounting Screw
This screw fastens the camera.
(U 1/4˝-20 UNC)

❻ Panning Head
The head rotates in panning directions.

❼ Tally Indicators (2 pcs.)
A selection signal lights them red.

❽ Camera Connector Panel
To connect a camera and lens.

❾ Base

❿ Mounting Holes
There are 4 holes to mount the pan/tilt head.

⓫ Wire Rod Mounting Hole
To pass a wire to prevent the pan/tilt head from falling.

⓬ Control Connector Panel
To connect a Control Panel (AW-RP301, RP305, or RP501) or the Multiport Hub (AW-HB505) and Pan/tilt Head AC Adapter (AW-PS300).

⓭ Side Blank Panel
A spare to be used in changing the mounting position of Control Connector Panel ⓬.

⓮ Bottom Blank Panel
A spare to be used in changing the mounting position of Control Connector Panel ⓬.

Installation

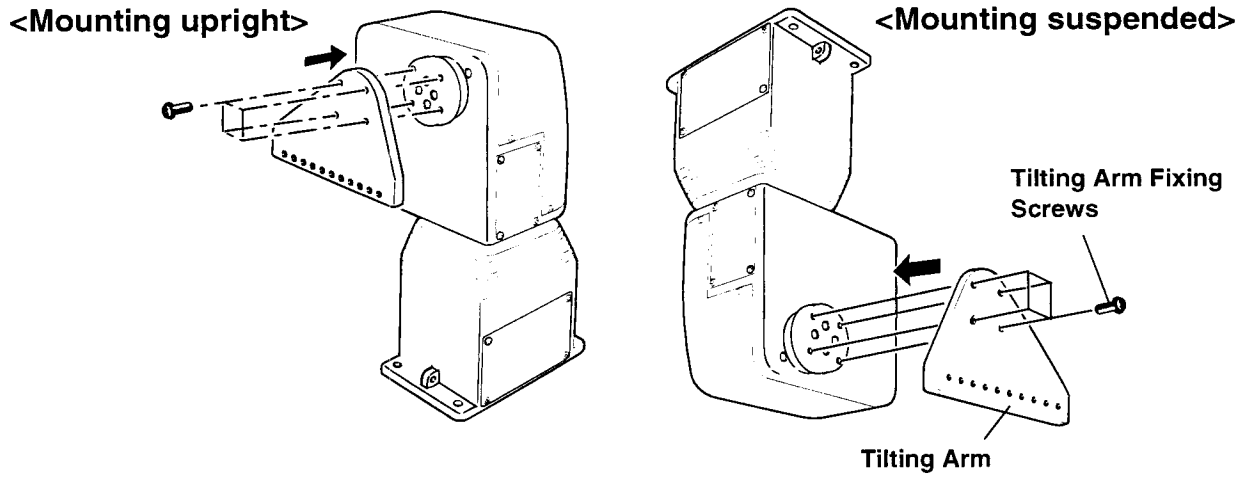
(The installation work must be performed by your dealer without fail.)

■ Assembling the Pan/tilt Head

In handling the pan/tilt head, be sure to hold it by the base.

- **Installing the Tilting Arm**

  Fasten the Tilting Arm (supplied) with the Tilting Arm Fixing Screws (supplied).
  The way of mounting the arm differs depending on the direction of pan/tilt head installation. (See the the figure below.)



<Note>

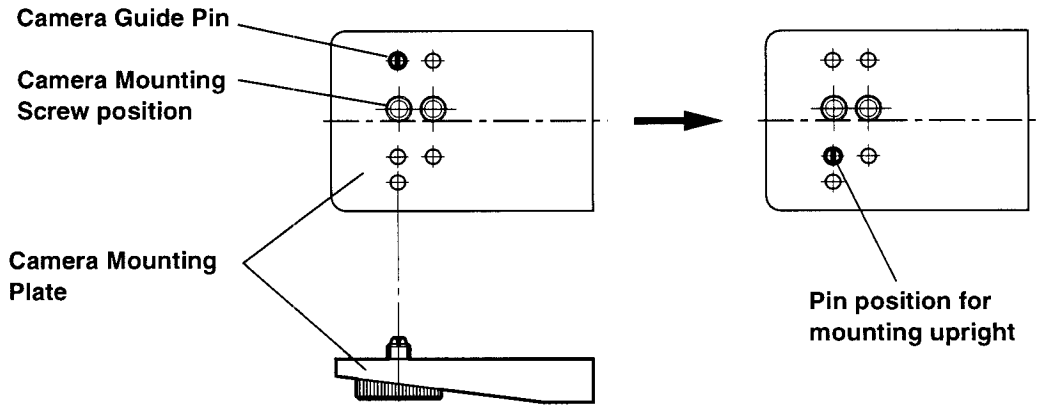
Do not use other than the supplied tilting arm fixing screws to fasten the tilting arm.

- **Fastening the Camera Mounting Plate**

  To mount the pan/tilt head upright, pull out the Camera Guide Pin from the Camera Mounting Plate, which is packed together with the pan/tilt head, and insert it into the hole shown in the figure below.
  (This is not necessary when mounting the pan/tilt head suspended.)

  <Note>

  Loosen the Camera Guide Pin with a screwdriver and remove it.
  Insert the Camera Guide Pin into the hole shown below and fasten it securely with a screwdriver.

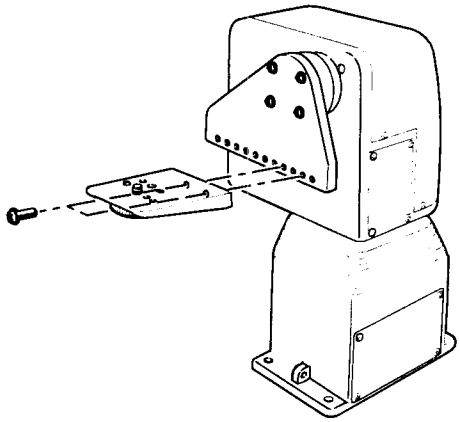


Installation

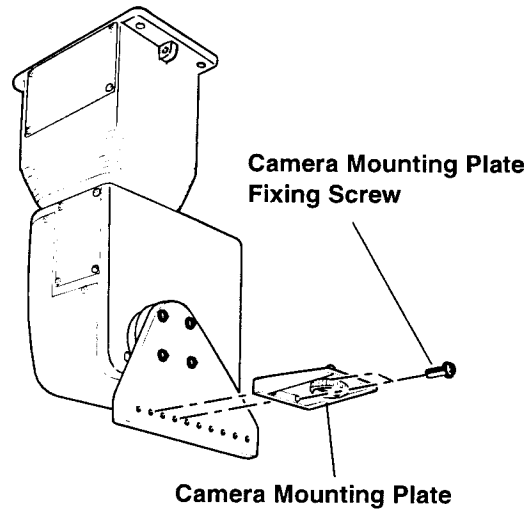
(The installation work must be performed by your dealer without fail.)

Fasten the Camera Mounting Plate as shown in the figure below.
(The Camera Mounting Plate and Camera Mounting Plate Fixing Screws are packed together.)
The position of the Camera Mounting Plate differs depending on the camera and lens used.
It is recommended that the position of the Camera Mounting Plate be so adjusted that the gravity center of the camera and lens will be perpendicular to the tilting center.

<Mounting upright>



<Mounting suspended>



<Note>
Do not use other than the supplied tilting arm fixing screws to fasten the tilting arm.

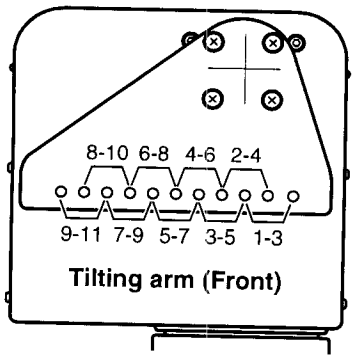
Installation

(The installation work must be performed by your dealer without fail.)

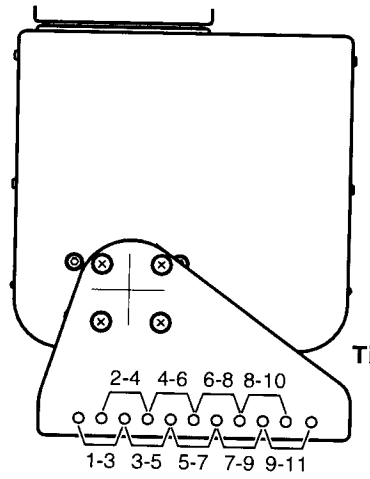
For Reference

Examples of screw positions on Camera Mounting Plate are shown below.

<Mounting upright>

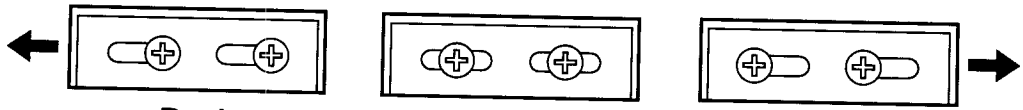


<Mounting suspended>



Tilting arm (Rear)

Camera mounting plate position



Camera No./Lens No. (without hood)	Tilting arm screw hole position	Camera mounting plate position
AW-E600+AW-S14XBMD	4-6	Front
AW-E600+AW-S14XBRM	6-8	Front
AW-E300+AW-LZ14MD55	5-7	Center
AW-E300+AW-LZ10MD6	4-6 (Rear)	Back
AW-E300+AW-LZ14ST55	5-7	Back

Installation

(The installation work must be performed by your dealer without fail.)

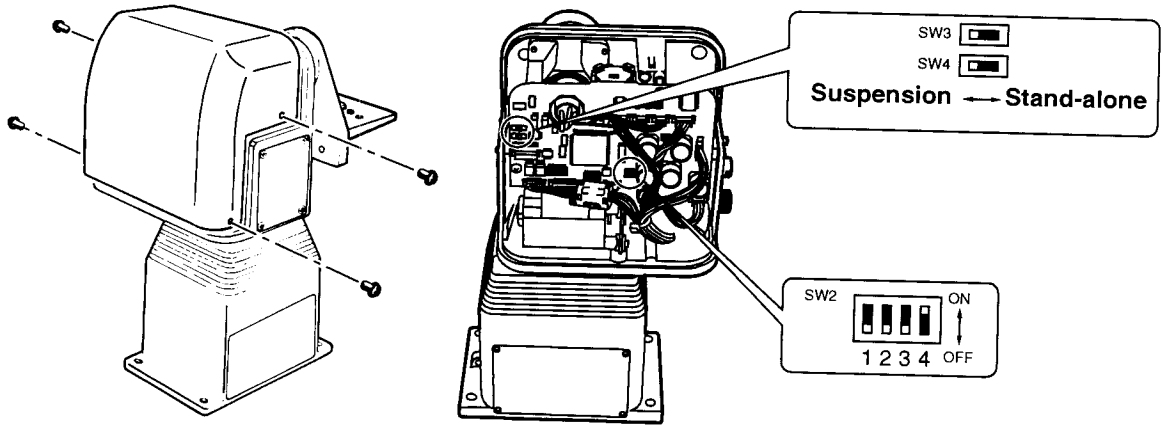
■ Before Installing

Before installing the pan/tilt head, be sure to make the following settings and changes.

- **Setting the installation direction selector switch and landing characteristics**
  Set the switches as follows to perform a stand-alone installation and or to select the landing characteristics. (Suspended installation and soft landing are the factory settings.)
  1. Remove the Rotary Head Cover Fixing Screws, and remove the cover slowly. (Take care when removing the cover since the tally LED wires are connected.)
  2. Set the SW2, SW3 and SW4 switches on the front PCB as follows.
     For suspended installation:
     Set SW3 and SW4 to their left-side positions (factory setting).
     For stand-alone installation:
     Set SW3 and SW4 to their right-side positions.
     For a soft landing:
     Set SW2 switch No.4 to its top (ON) position (factory setting).
     For a precise landing:
     Set SW2 switch No.4 to its bottom (OFF) position.
  3. Upon completion of the settings, return the cover to its original position, and secure it using the screws (while taking care not to pinch the wires).

<Notes>

- Before setting the switches, make absolutely sure that the power of the AC adapter which is to be connected to the pan/tilt head is set to OFF.
- The landing characteristics are not changed simply by selecting the switch positions. They are changed only after the power is turned off and back on again after the switches have been set.



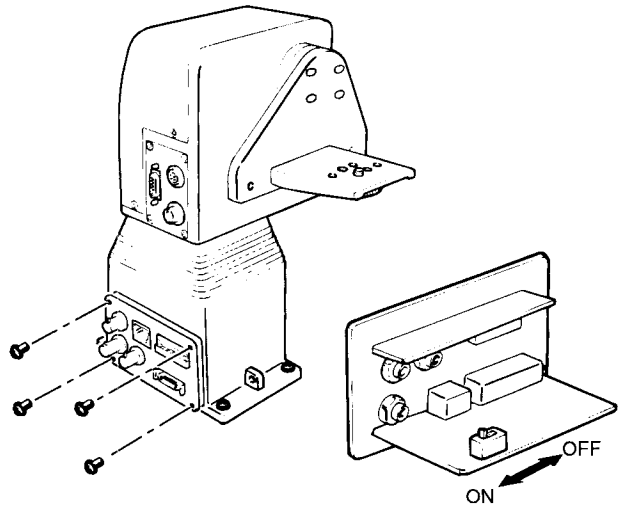
Installation

(The installation work must be performed by your dealer without fail.)

- **Setting the Cable Compensation Circuit**

  If the pan/tilt head is connected to the controller with coaxial cables (5C-2V), the maximum allowable distance between them is 500 meters. If the cable length between them is more than 300 meters, however, set the cable compensation circuit switch to the ON position as described below.

  1. Remove the 4 screws from Control Connector Panel and pull the panel out toward you.
  2. Set the switch on the PCB on the back of the panel to the ON position.
  3. Mount Control Connector Panel back and fasten it with the screws.



Installation

(The installation work must be performed by your dealer without fail.)

- **Changing Others**

Changing the Position of Control Connector Panel

The position of Control Connector Panel can be changed if necessary.

1. Remove the blank panel in the position where you wish to mount Control Connector Panel.
2. Remove the screws from Control Connector Panel and pull the panel out toward you.
3. Disconnect all the 6 connectors on the PCB on the back of the panel.
4. Take Control Connector Panel to the desired position, and connect the PCB connectors back as before.
5. Fasten Control Connector Panel and the blank panel with the screws.

Changing the Direction of Control Connector Panel

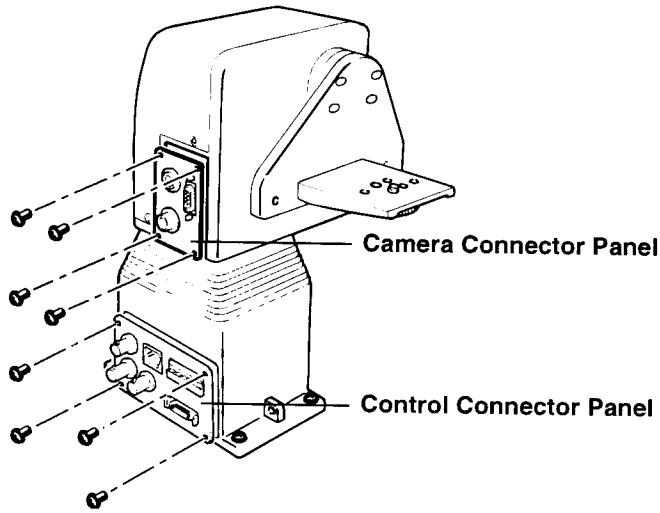
The direction of Control Connector Panel can be changed by 180° if necessary.

1. Remove the screws from Control Connector Panel and pull the panel out toward you.
2. Turn the panel 180°, and place it back in position.
3. Fasten the panel with the screws.

Changing the Direction of Camera Connector Panel

The direction of Camera Connector Panel can be changed by 180° if necessary.

1. Remove the screws from Camera Connector Panel and pull the panel out toward you.
2. Turn the panel 180°, and place it back in position.
3. Fasten the panel with the screws.



Installation

(The installation work must be performed by your dealer without fail.)

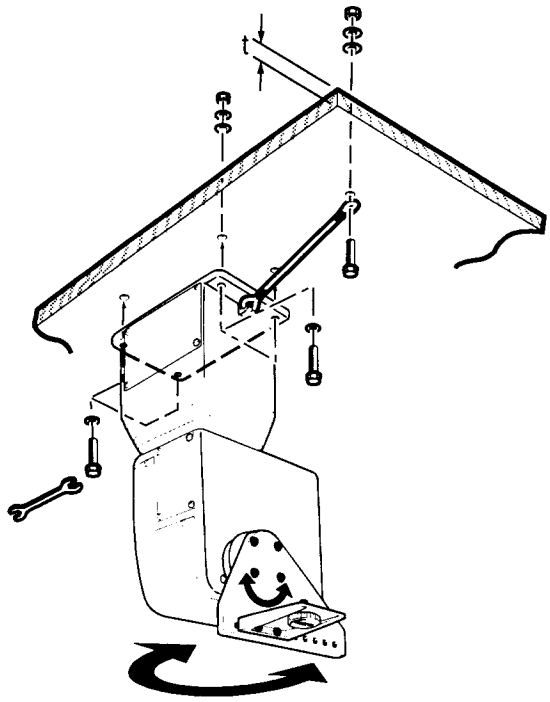
■ Mounting the Pan/tilt Head

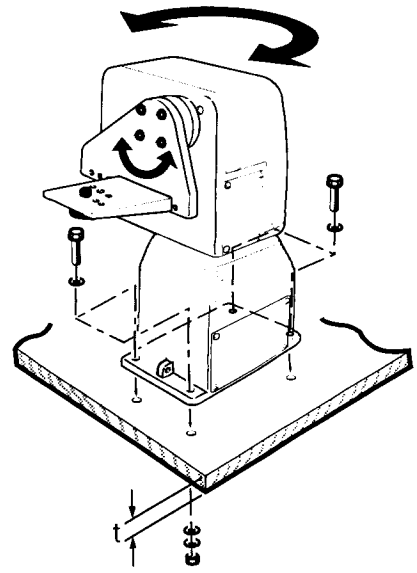
Observe the following instructions for mounting the pan/tilt head.
Failure to observe these instructions could cause the pan/tilt head to come off or drop, possibly resulting in an accident.

- To mount the pan/tilt head, use the 4 mounting holes and fasten the head securely.
- Have M6 hex bolts ready for mounting the head.
- The hex bolts must be long enough to meet the requirement "mounting material thickness (t) plus 25 mm or longer."
- Use plain and spring washers and hex nuts with the hex bolts as shown in the figure.
- Use a wrench of the size that fits the hex bolt head to tighten the hex bolts.
- To mount the pan/tilt head suspended, pass wire through the anti-drop wire hole and fasten the pan/tilt head to a ceiling or other firm object, securing it with the wire.
- Have a wire ready strong enough to bear the overall weight of the pan/tilt head, camera and lens.

<Note>

In mounting the pan/tilt head, never forcibly turn the head or tilting arm in the direction of the arrows by hand.



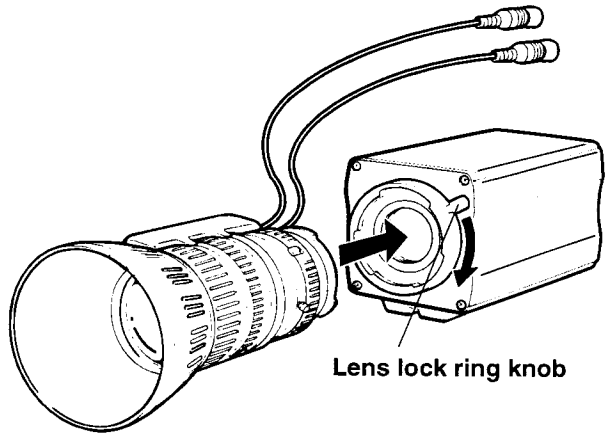


Installation

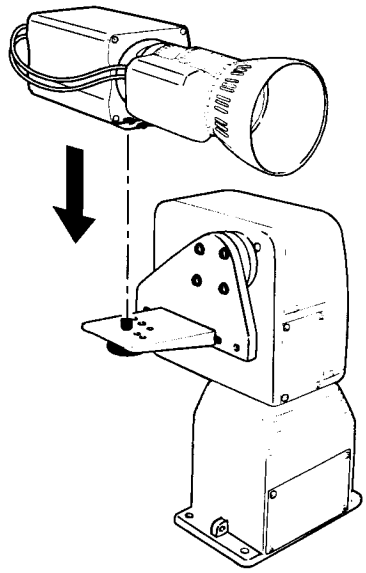
(The installation work must be performed by your dealer without fail.)

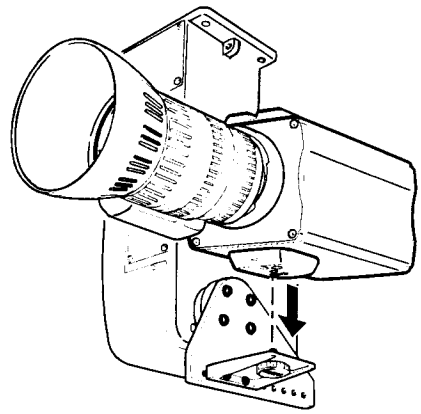
■ Mounting a Camera

- **Mounting a Lens**
  1. Turn the lens lock ring knob fully counterclockwise.
  2. Remove the lens mount cap if any.
  3. Mount the lens with the lens positioning pin up.
  4. Turn the lens lock ring knob clockwise to securely fasten the lens.



- **Mounting a Camera**
  1. Hold the camera and place it on Camera Mounting Plate.
  2. Hold the camera and insert Camera Guide Pin into the guide hole in the camera.
  3. Hold the camera and tighten Camera Mounting Screw to securely fasten the camera. (Be sure to use a screwdriver or other tools to tighten the screw.)
  4. After mounting the camera, make sure that the camera is not loose.

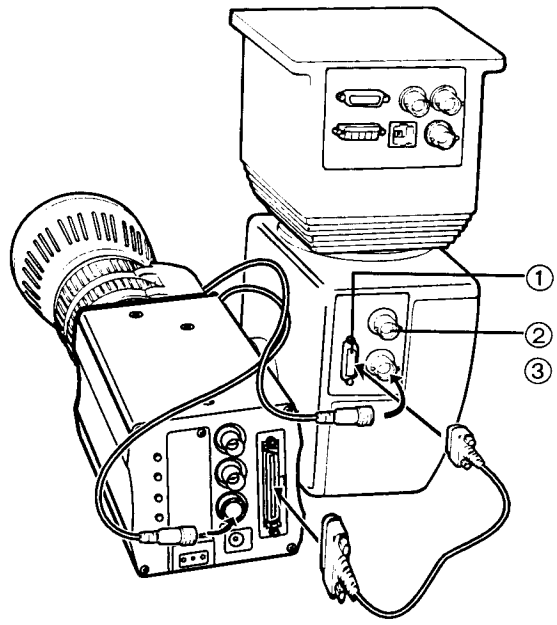




Connections

■ Connecting Camera Connector Panel

Connect the camera and lens control cables.



① **CAMERA I/F**

Connector for controlling the convertible camera

Connect it to the REMOTE connector on the camera.

Use the AW-CA50T15 Camera Cable (sold separately) as the connecting cable.

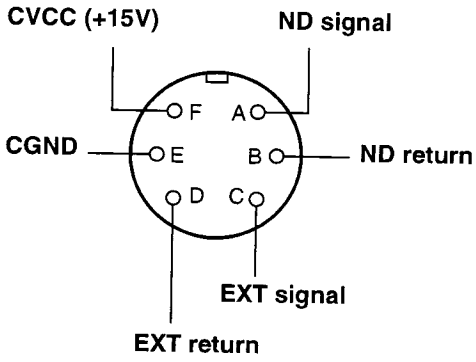
Use the AW-CA50A15 Cable (sold separately) when controlling the camera using the RS-232C interface facility.

② **ND/EXT**

Control connector for motor-driven lens unit's ND filter and lens extender

When using a motor-driven lens unit having ND filters and lens extender function, connect it to that unit.

Pins are located as follows:



(As viewed from cable end)

③ **LENS I/F**

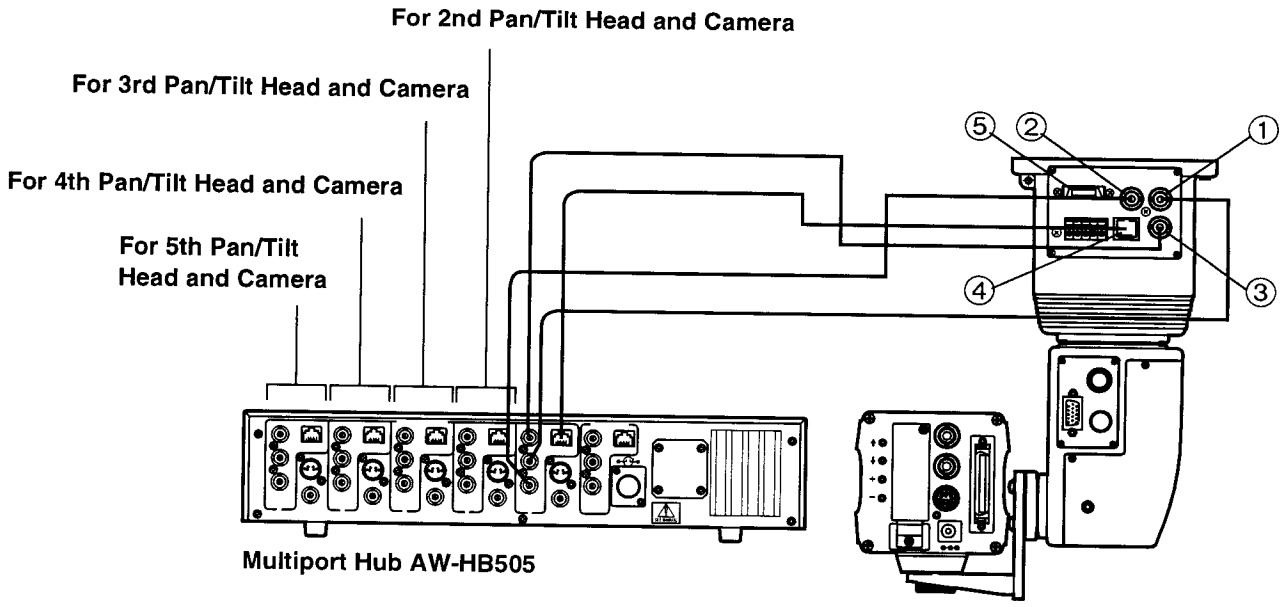
Control connector for motor-driven lens unit's zoom and focus

Connect the remote (zoom/focus) control cable of the motor-driven lens unit to it.

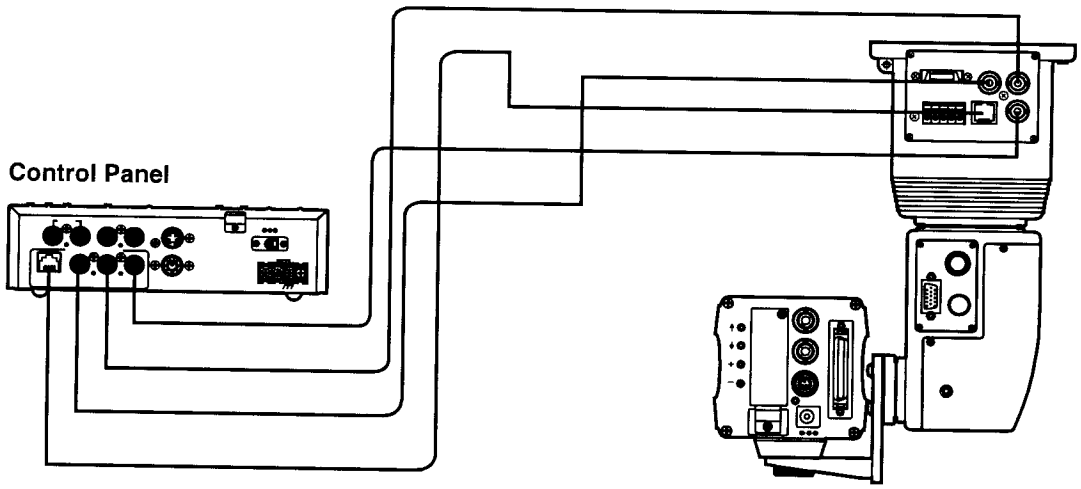
Connections

■ Connecting Control Connector Panel

- **Connecting to Multiport Hub or Control Panel**
  Connect this panel to the Multiport Hub AW-HB505 or the Control Panel AW-RP301, RP305 or RP501.



The figure above shows the connections when only one pan/tilt head with camera is connected.
To use two or more pan/tilt heads with cameras, connect the second and subsequent pan/tilt heads with cameras in a similar way.



Connections

① **G/L IN**

Genlock signal input connector

Connect it to the G/L OUT connector on the Multiport Hub (AW-HB505) or Control Panel (AW-RP501) with a BNC coaxial cable.

② **CAMERA CONTROL IN**

Camera control signal connector

Connect it to the CAMERA CONTROL OUT connector on the Multiport Hub (AW-HB505) or Control Panel (AW-RP501) with a BNC coaxial cable.

To control the camera from a PC using the RS-232C interface facility, connect it to the BNC coaxial cable end of the AW-CA28T9 RS-232C Cable (sold separately).

(See pages 20 to 22)

③ **VIDEO OUT**

Camera video output connector

Connect it to the VIDEO IN connector on the Multiport Hub (AW-HB505) or Control Panel (AW-RP501) with a BNC coaxial cable.

④ **P/T CONTROL IN (SERIAL)**

Pan/tilt head control signal connector

Connect it to the PAN/TILT CONTROL OUT connector on the Multiport Hub (AW-HB505) or Control Panel (AW-RP301, AW-RP305, or AW-RP501) with a 10BASE-T straight cable (UTP category 5).

Connections

⑤ P/T CONTROL IN (CONTACT/RS-232C)

Connector for the controller for RS-232C interface control from the PC and for contact control.

To exercise control using the RS-232C interface facility, connect the AW-CA28T9 RS-232C Cable (sold separately). For contact control, use a cable which supplies the required signals listed in the table below. Use a cable that has a nominal cross-sectional area of at least 0.3 mm^2 and that complies with the provisions of the Electrical Appliance and Material Control Law.

Compatible plug: Bellows type with 28 pins and 1.27 mm pitch

Pin No.	Contact Signal	RS-232C Signal	Functions
1—7	Not used	Not used	————
8	Not used	TXD	Pan/tilt head send data
9	Not used	RXD	Pan/tilt head receive data
10	GND	GND	————
11	UP	Not used	Up tilt control input
12	DOWN	Not used	Down tilt control input
13	LEFT	Not used	Left pan control input
14	RIGHT	Not used	Right pan control input
15	RUN-SIG	Not used	Output signal showing head running
16—25	Not used	Not used	————
26	DI OPT SEL	Not used	Pan/tilt head and camera power control input
27	Not used	Not used	————
28	GND	GND	————

<Notes>

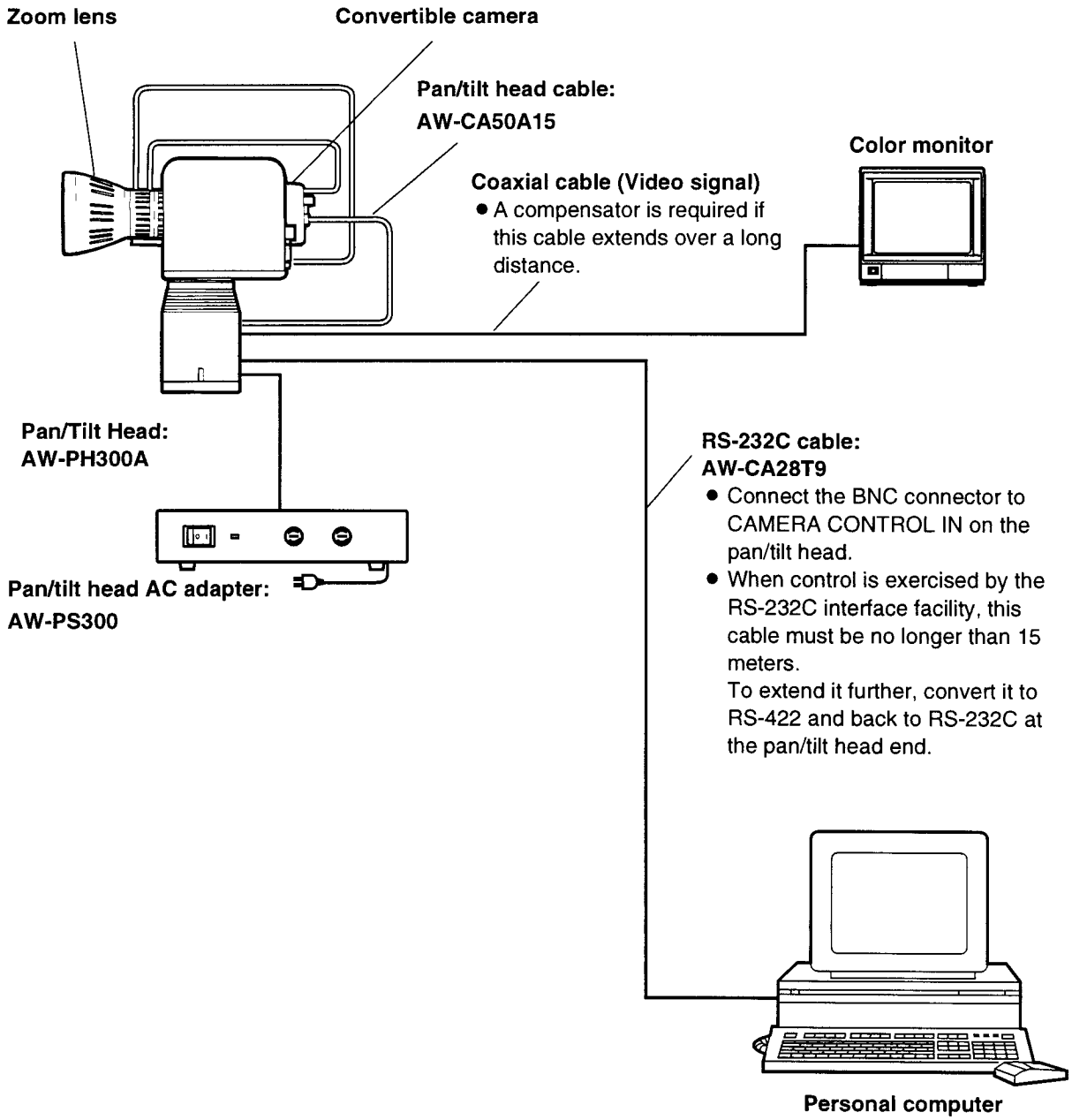
- When cables for exercising control over both the RS-232C (PC, etc.) interface facility and control panel (AW-RP501, etc.) have been connected, the control operation initiated last will take precedence.
- Only one means—either the RS-232C interface facility or the control panel—can be used to control the camera.
- The pan/tilt head's position as well as the lens zoom, focus, iris and other information can be recalled at the RS-232C side. However, the white balance information which has been set at the control panel side cannot be recalled at the RS-232C side.

Connections

■ Connecting the RS-232C Control

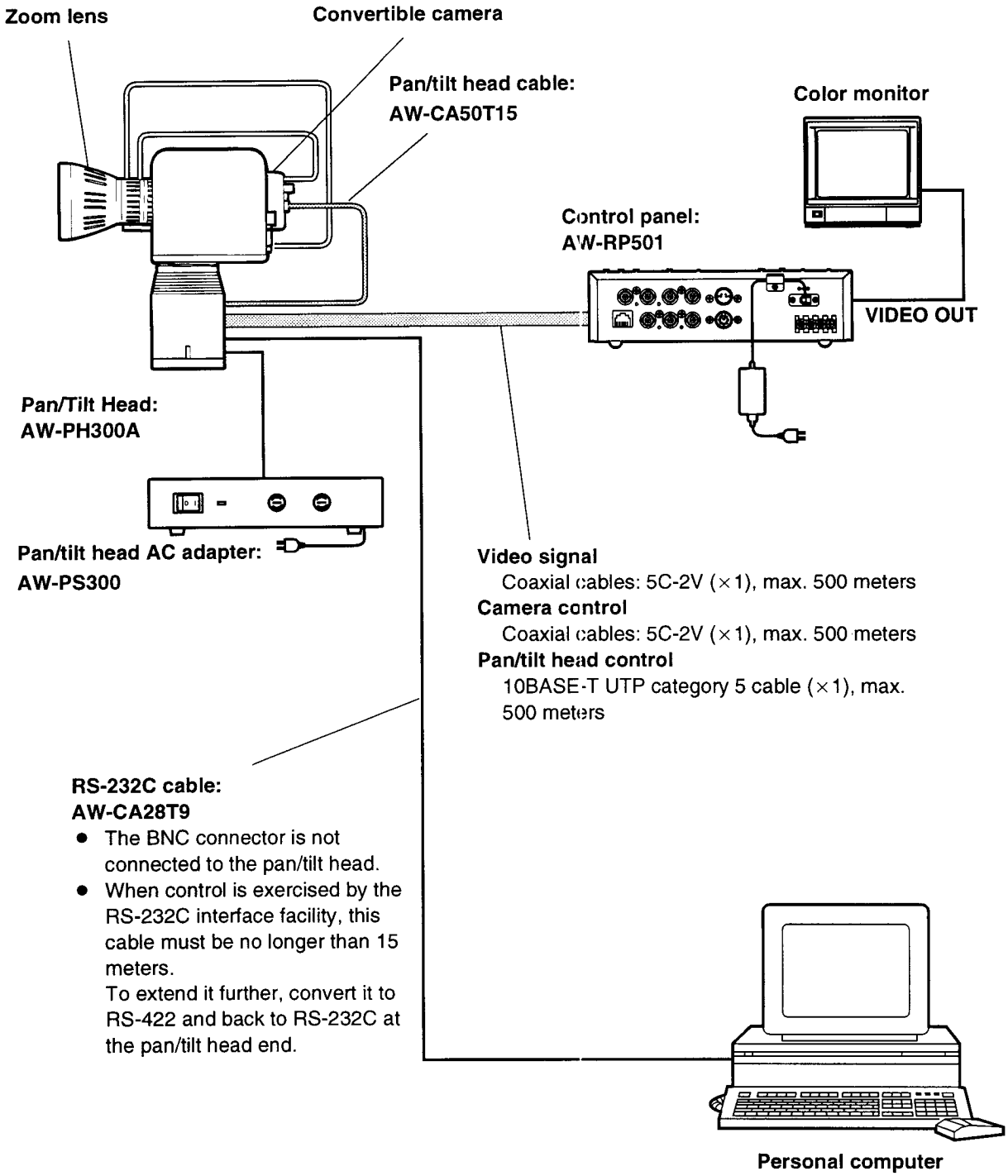
- **When using the RS-232C interface facility to control the camera and pan/tilt head**

Camera	Lens
AW-E300	AW-LZ14MD55
AW-E600	AW-S14XBMD
AW-E800	AW-LZ17MD9


Zoom lens
Convertible camera
Pan/tilt head cable:
AW-CA50A15
Color monitor
Coaxial cable (Video signal)
• A compensator is required if this cable extends over a long distance.
Pan/Tilt Head:
AW-PH300A
RS-232C cable:
AW-CA28T9
• Connect the BNC connector to CAMERA CONTROL IN on the pan/tilt head.
• When control is exercised by the RS-232C interface facility, this cable must be no longer than 15 meters.
To extend it further, convert it to RS-422 and back to RS-232C at the pan/tilt head end.
Pan/tilt head AC adapter:
AW-PS300
Personal computer

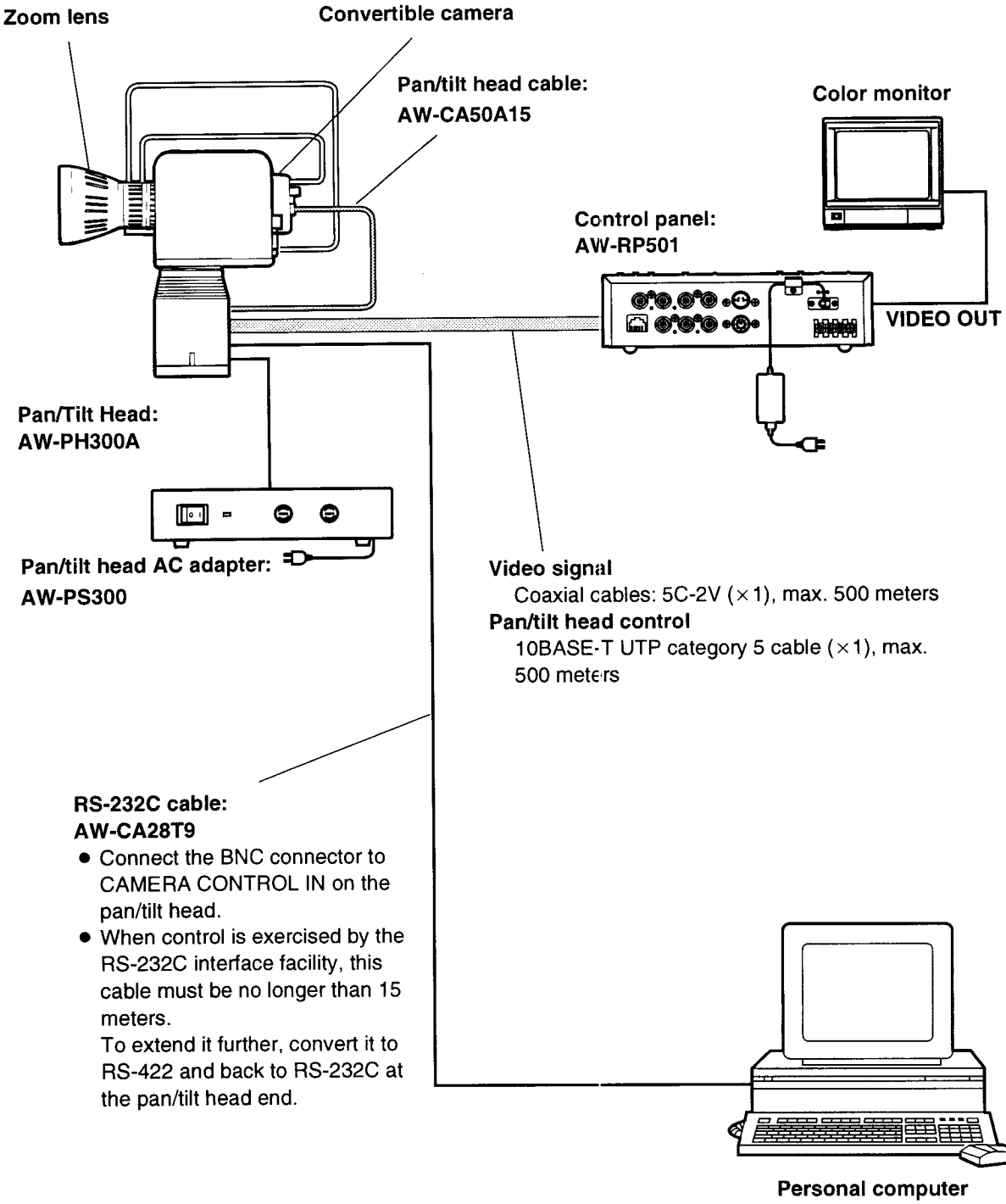
Connections

- **To control the camera by the control panel and control the pan/tilt head using both the RS-232C interface facility and control panel**


Zoom lens
Convertible camera
Pan/tilt head cable:
AW-CA50T15
Color monitor
Control panel:
AW-RP501
VIDEO OUT
Pan/Tilt Head:
AW-PH300A
Pan/tilt head AC adapter:
AW-PS300
Video signal
Coaxial cables: 5C-2V (×1), max. 500 meters
Camera control
Coaxial cables: 5C-2V (×1), max. 500 meters
Pan/tilt head control
10BASE-T UTP category 5 cable (×1), max. 500 meters
RS-232C cable:
AW-CA28T9
• The BNC connector is not connected to the pan/tilt head.
• When control is exercised by the RS-232C interface facility, this cable must be no longer than 15 meters.
To extend it further, convert it to RS-422 and back to RS-232C at the pan/tilt head end.
Personal computer

Connections

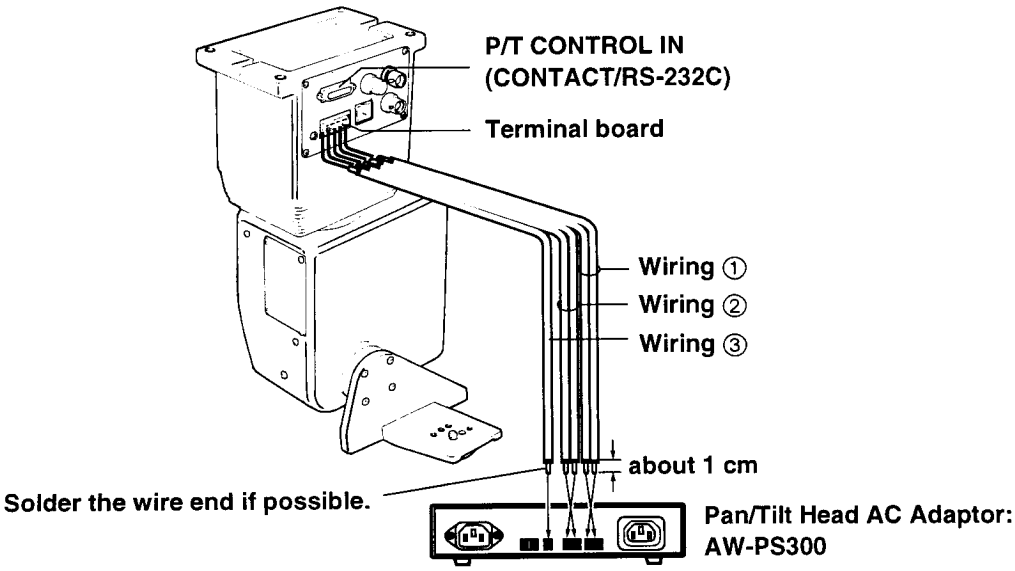
- **To control the camera using the RS-232C interface facility and control the pan/tilt head using both the RS-232C interface facility and control panel**


Zoom lens
Convertible camera
Pan/tilt head cable:
AW-CA50A15
Color monitor
Control panel:
AW-RP501
VIDEO OUT
Pan/Tilt Head:
AW-PH300A
Pan/tilt head AC adapter:
AW-PS300
Video signal
Coaxial cables: 5C-2V (×1), max. 500 meters
Pan/tilt head control
10BASE-T UTP category 5 cable (×1), max. 500 meters
RS-232C cable:
AW-CA28T9
• Connect the BNC connector to CAMERA CONTROL IN on the pan/tilt head.
• When control is exercised by the RS-232C interface facility, this cable must be no longer than 15 meters.
To extend it further, convert it to RS-422 and back to RS-232C at the pan/tilt head end.
Personal computer

Connections

■ Connecting the Pan/tilt Head AC Adapter

Connect the Pan/tilt Head AC Adapter AW-PS300.



Terminal Board DC 12V IN (Wire ①)

Connect it to DC 15V OUT on the Pan/tilt Head AC Adapter AW-PS300. (The AC adapter is set to an output voltage of 15 V, considering a voltage drop due to an extended cable between the pan/tilt head and the adapter.)

Make sure that the positive (+) end and negative (–) end of the wire are connected to the same signs on the terminal.

Use a DC cable with a nominal cross section of 1.25 mm^2 or more that meets the UL specifications.

Terminal Board LAMP CONTROL (Wire ②)

Connect it only in case of supplying power from LAMP AC OUT on the Pan/Tilt Head AC Adapter AW-PS300 to the halogen lamp.

Connect it to LAMP CONTROL on the Pan/Tilt Head AC Adapter.

The symbols C and S of the wire must match the same symbols on the terminal.

Use a cable with a nominal cross section of 0.3 mm^2 or more that meets the UL specifications.

Terminal Board OP (Wire ③)

Connect it only in case of using OP SW CONTROL OUT on the Pan/Tilt Head AC Adapter AW-PS300.

Connect it to OPTION SW CONTROL IN on the Pan/Tilt Head AC Adapter.

Use a cable with a nominal cross section of 0.3 mm^2 or more that meets the UL specifications.

Limiters

It is recommended that the limiters (operating range) be set before use.
Depending on where the pan/tilt head is installed, the camera might contact an obstacle present in the operating range.
In such a case, the limiters may be set to prevent this happening.
The limiters can be set from the control panel at four points: upper limit, lower limit, left limit, and right limit.
Once the limiters are set, the set positions remain valid even if power is switched off.

■ Setting the Limiters

- **Setting the Operating Range Upper Limit**
  1. Turn the camera to the desired upper limit from the control panel.
  2. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-2 Switch and PRESET-3 Switch for 5 seconds or more.
  3. When the LED for PRESET-5 Switch lights to indicate that the upper limit has been set, release the switches.
  4. Check on the control panel that the upper limit has been correctly set.

- **Setting the Operating Range Lower Limit**
  1. Turn the camera to the desired lower limit from the control panel.
  2. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-7 Switch and PRESET-8 Switch for 5 seconds or more.
  3. When the LED for PRESET-5 Switch lights to indicate that the lower limit has been set, release the switches.
  4. Check on the control panel that the lower limit has been correctly set.

- **Setting the Operating Range Left Limit**
  1. Turn the camera to the desired left limit from the control panel.
  2. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-1 Switch and PRESET-6 Switch for 5 seconds or more.
  3. When the LED for PRESET-5 Switch lights to indicate that the left limit has been set, release the switches.
  4. Check on the control panel that the left limit has been correctly set.

- **Setting the Operating Range Right Limit**
  1. Turn the camera to the desired right limit from the control panel.
  2. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-4 Switch and PRESET-9 Switch for 5 seconds or more.
  3. When the LED for PRESET-5 Switch lights to indicate that the right limit has been set, release the switches.
  4. Check on the control panel that the right limit has been correctly set.

Limiters

■ Releasing the Limiters

The set limiters can be released by taking the following steps.

- **Releasing the Operating Range Upper Limit**
  1. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-2 Switch and PRESET-3 Switch for 5 seconds or more.
  2. When the LED of PRESET-10 Switch lights, it indicates that the limit has been released. Release the switches.

- **Releasing the Operating Range Lower Limit**
  1. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-7 Switch and PRESET-8 Switch for 5 seconds or more.
  2. When the LED of PRESET-10 Switch lights, it indicates that the limit has been released. Release the switches.

- **Releasing the Operating Range Left Limit**
  1. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-1 Switch and PRESET-6 Switch for 5 seconds or more.
  2. When the LED of PRESET-10 Switch lights, it indicates that the limit has been released. Release the switches.

- **Releasing the Operating Range Right Limit**
  1. Keep the MEMORY Switch on the control panel depressed, then simultaneously press PRESET-4 Switch and PRESET-9 Switch for 5 seconds or more.
  2. When the LED of PRESET-10 Switch lights, it indicates that the limit has been released. Release the switches.

■ Resetting the Limiters

The same operation alternately applies to setting the limiters and releasing the limiters. To set the limiters again, release the limiters and repeat the steps for setting the limiters.

The existing limiter settings can be set again by taking the following steps.

1. Release the desired limits by following the procedures described in Releasing the Limiters.
2. Set the desired limits again by following the procedures described in Setting the Limiters.

Replacement of Expendables

- **Battery Replacement**

  The battery has a life of about 5 years.

  The pan/tilt head has data on preset positions, limiter positions and others stored in itself. The stored data is kept in the memory even if power is switched off, but will be lost upon switching power off after the end of battery life.

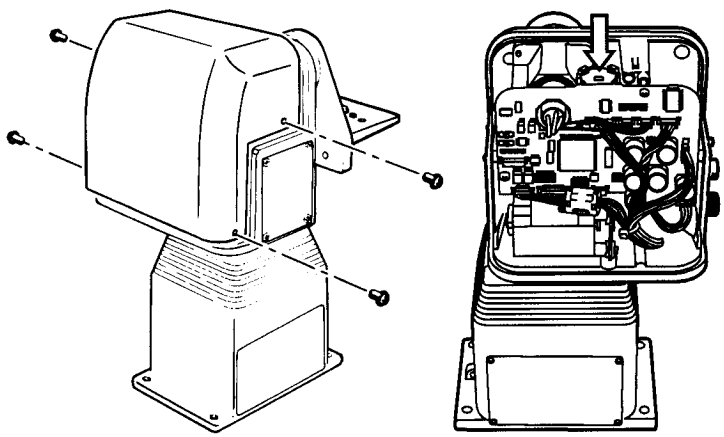
  If the battery has lost power, replace it with a new one. (Use the manganese dioxide lithium battery CR2032 for replacement.)

  Removing the Battery

  1. Remove the 4 cover screws and take off the pan/tilt head cover.
  2. Push the battery in the arrow direction (shown in the figure) to slide it.
  3. Raise the sliding battery from the bottom indicated by the arrow.
  4. When the arrow-indicated part of the battery has come off the battery holder, pull the battery out toward you.

  Installing a New Battery

  1. Insert a new battery into the battery holder in the direction of the arrow, with the positive side facing you.
  2. Push the battery into the holder in the direction of the arrow.



- **Motor Replacement**

  The drive motor of the pan/tilt head has a life of about 5 years. If motor operation is not normal, the motor must be replaced.

  Consult your dealer for motor replacement.

- **Gear Replacement**

  The gear has a life of about 5 years. If preset stop positions becomes less accurate, the gear must be replaced.

  Consult your dealer for gear replacement.

Specifications

Source Voltage:
12 V DC (DC jack)
Power Consumption:
2.5 A (including camera power)
0.7 A (pan/tilt head only)

Genlock Input:
1.0 V [p-p], black burst or composite video, 75Ω
(BNC connector)
Camera Video Output:
1.0 V [p-p] composite video, 75Ω
(BNC connector)
***Camera* Control:**
Two-way serial communication
(BNC connector)
Pan/tilt Control:
RS485 or equivalent (8-pin modular jack)
Pan/tilt Control:
RS-232C/contact signal (28-pin, half-pitch connector)
Lamp Control:
Control signal (terminals)
Option Control:
Control signal (terminals)
Maximum cable length:
500 m (In case of using coaxial cables 5C-2V and 10BASE-T sraight cable UPT category-5)
Maximum load:
4kg (maximum)
Operating temperature:
14°F to +113°F (–10°C to +45°C)
Operating humidity:
Less than 90%
Dimensions (W×H×D):
5 1/8″×9 5/8″×7 9/16″
(130×244×192 mm)
Weight:
7.7 lb (3.5 kg)
Finish:
AV Ivory painting (approximate color: Munsell 7.9Y 6.8/0.8)

■ Functions/Performance

Tilting Angle:
190° (approx. ±95°)
The tilt range may be less depending on the cable, lens, etc. of the camera mounted.
Panning Angle:
300° (approx. ±150°)
Maximum Speed:
Panning: 25°/sec, tilting: 20°/sec
Repeatability:
Less than ±5′
Noise Level:
Less than NC30

Weight and dimensions indicated are approximate.
Specifications are subject to change without notice.

Panasonic

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Division of Matsushita Electric of Puerto Rico Inc.
San Gabriel Industrial Park, 65th Infantry Ave., Km. 9.5, Carolina, Puerto Rico 00630 (787) 750-4300

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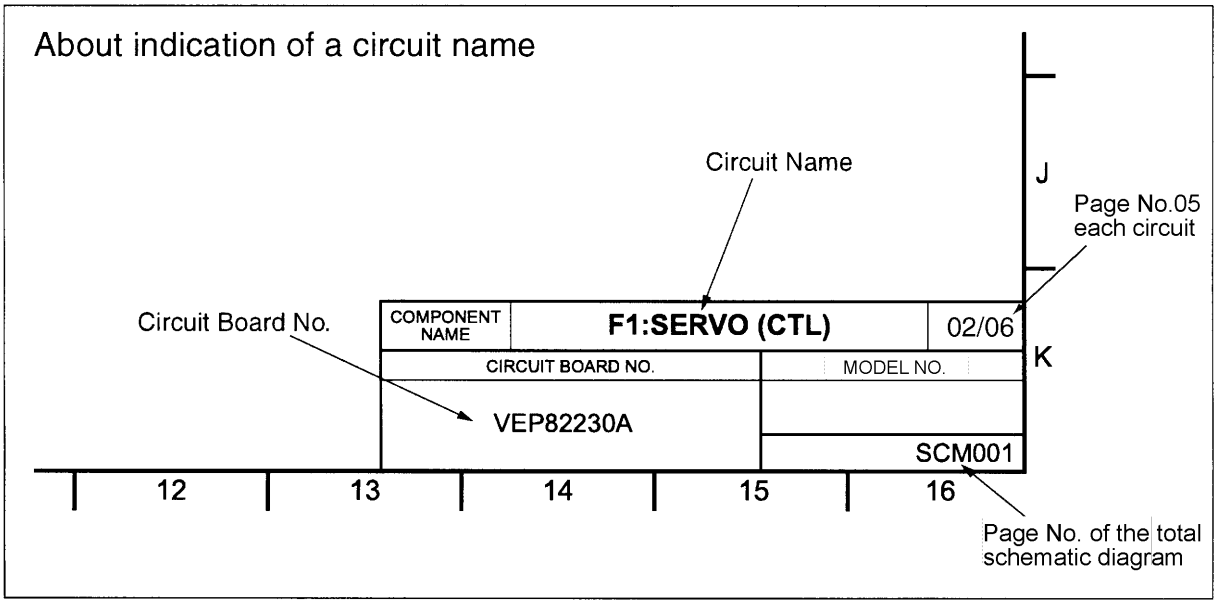
SECTION 2

SCHEMATIC DIAGRAMS



NOTE:
BE SURE TO MAKE YOUR ORDERS OF REPLACEMENT PARTS ACCORDING TO PARTS LIST, SECTION4

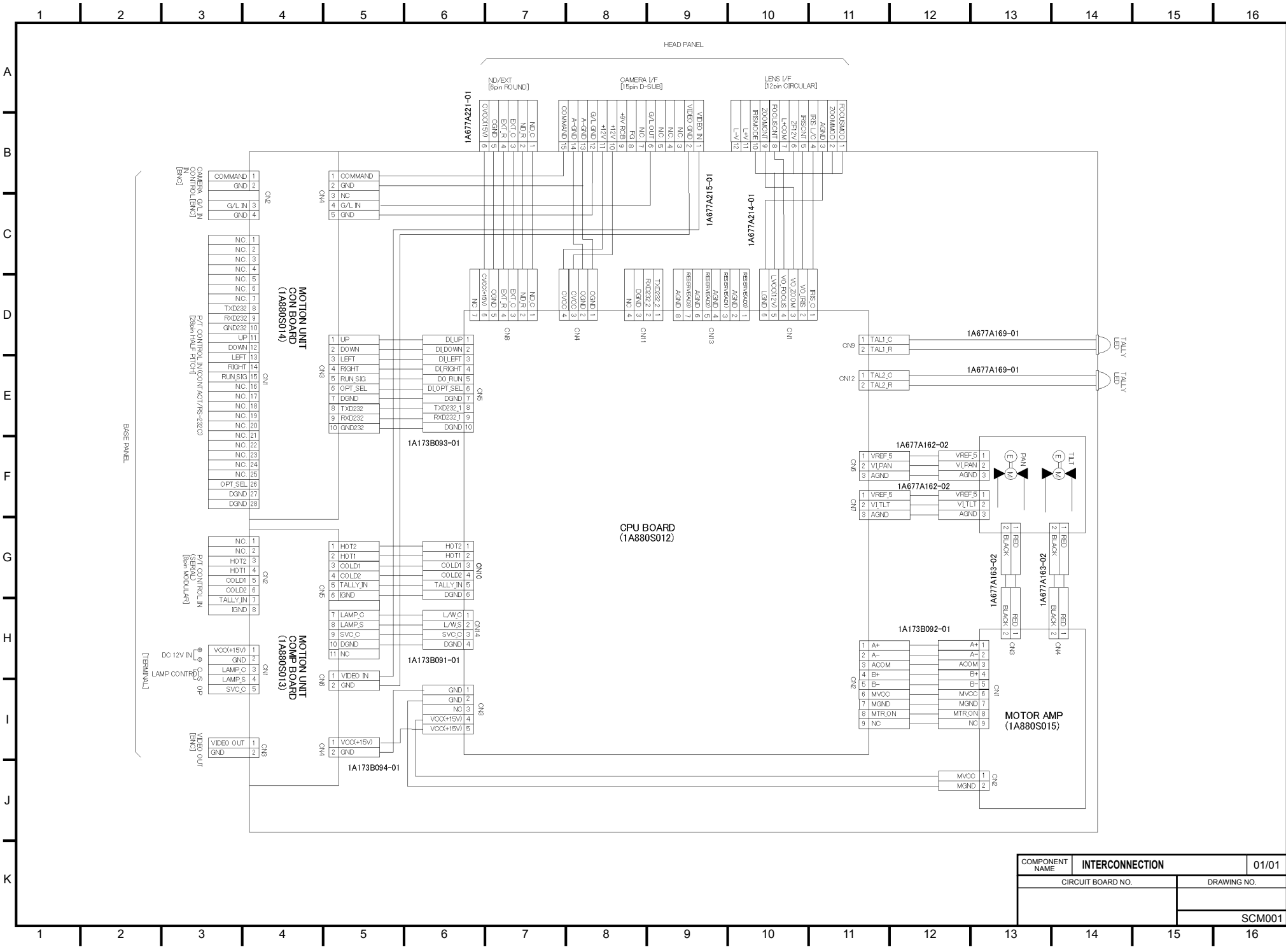
CAUTION

THE ▭ MARK INDICATES THE PRIMARY CIRCUIT TO DISTINGUISH THE PRIMARY FROM THE SECONDARY CIRCUIT.
PAY ATTENTION NOT TO RECEIVE AN ELECTRIC SHOCK DURING REPAIR AND SERVICE OF THE PRODUCTS.

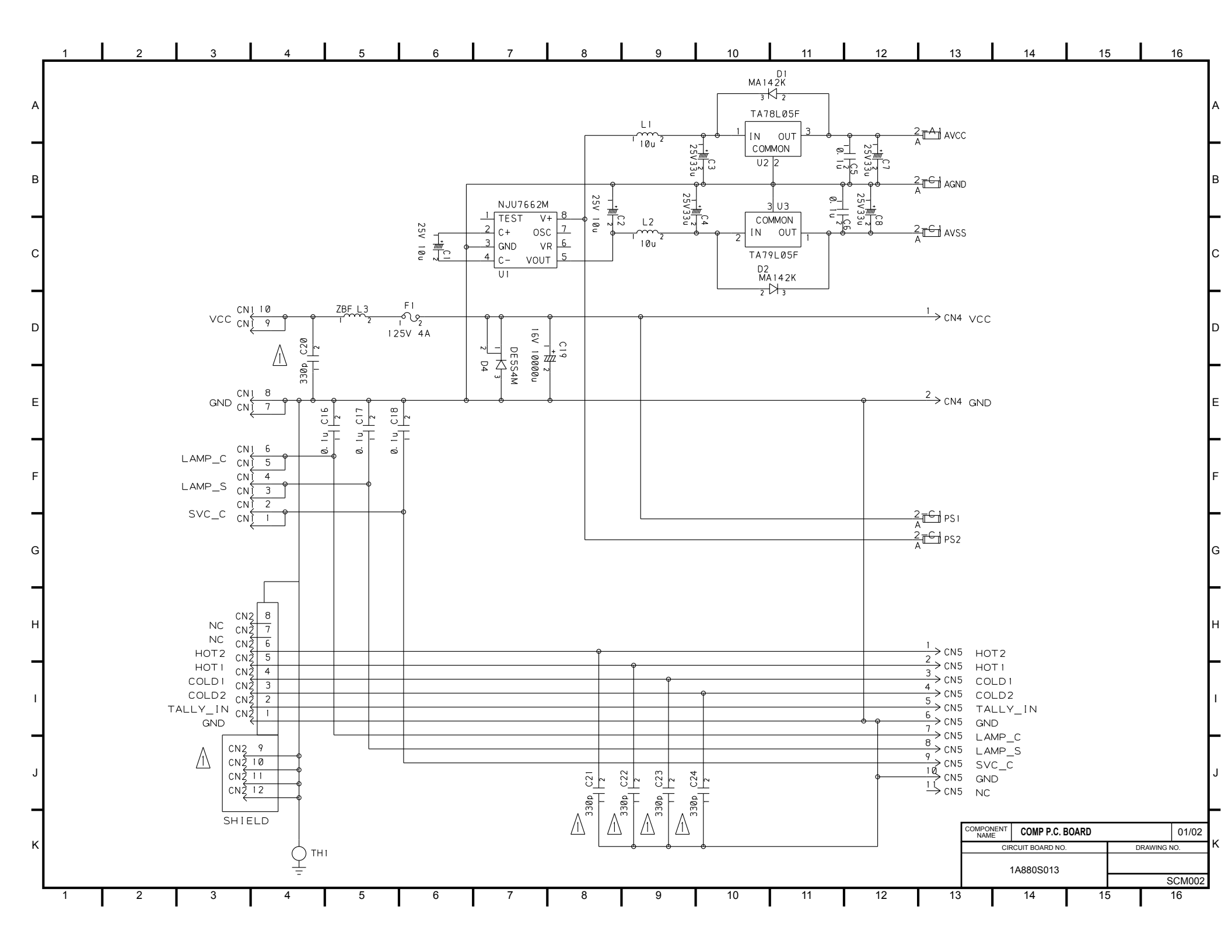
IMPORTANT SAFETY NOTICE:
COMPONENTS IDENTIFIED WITH THE MARK ⚠ HAVE THE SPECIAL CHARACTERISTICS FOR SAFETY.
WHEN REPLACING ANY OF THESE COMPONENTS, USE ONLY THE SAME TYPE.

CONTENTS

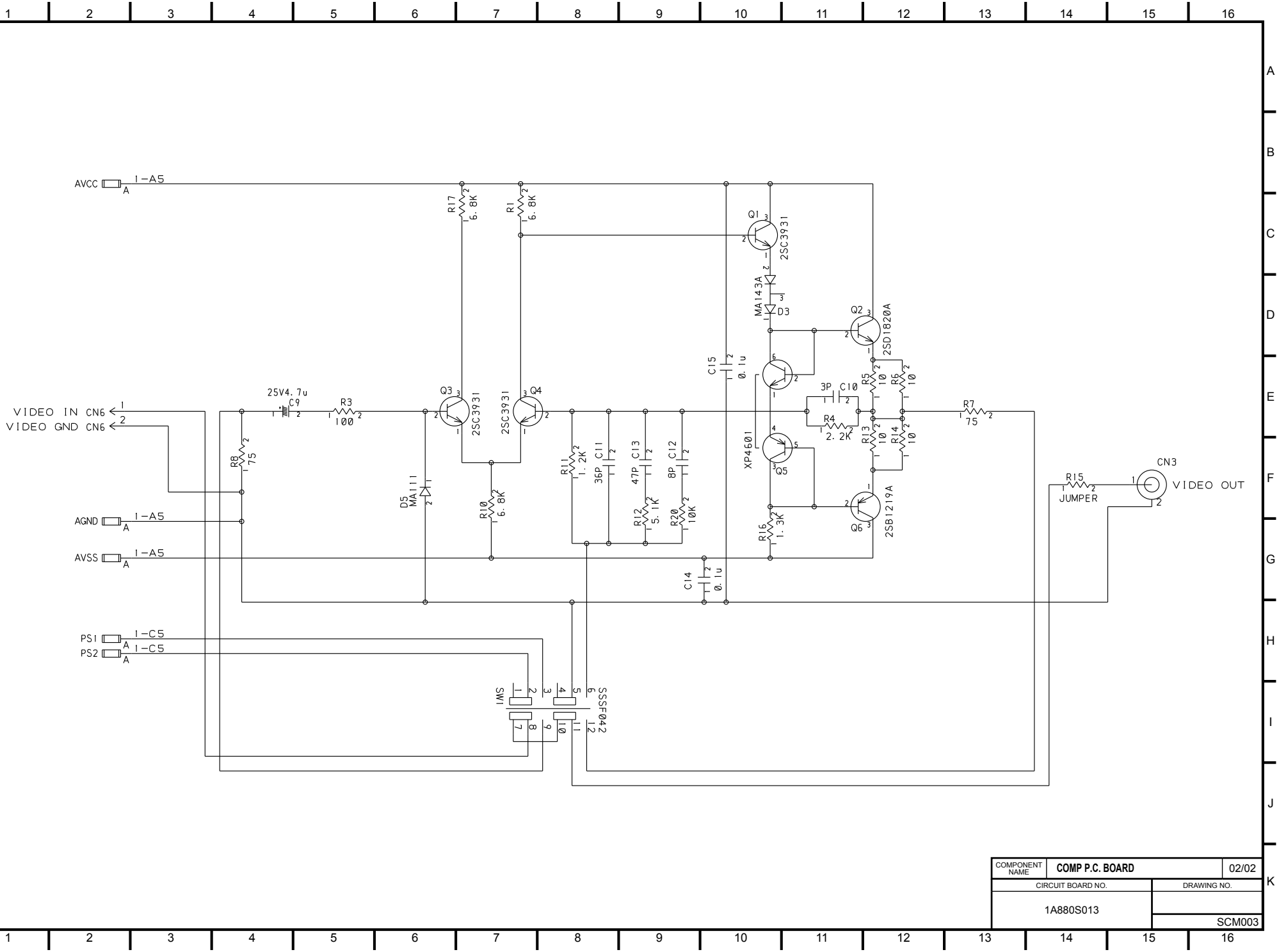
INTERCONNECTION SCM1
MOTION UNIT COMP BOARD SCM2
MOTION UNIT CON BOARD SCM4
MOTOR AMP SCM5
CPU P.C.BOARD SCM6



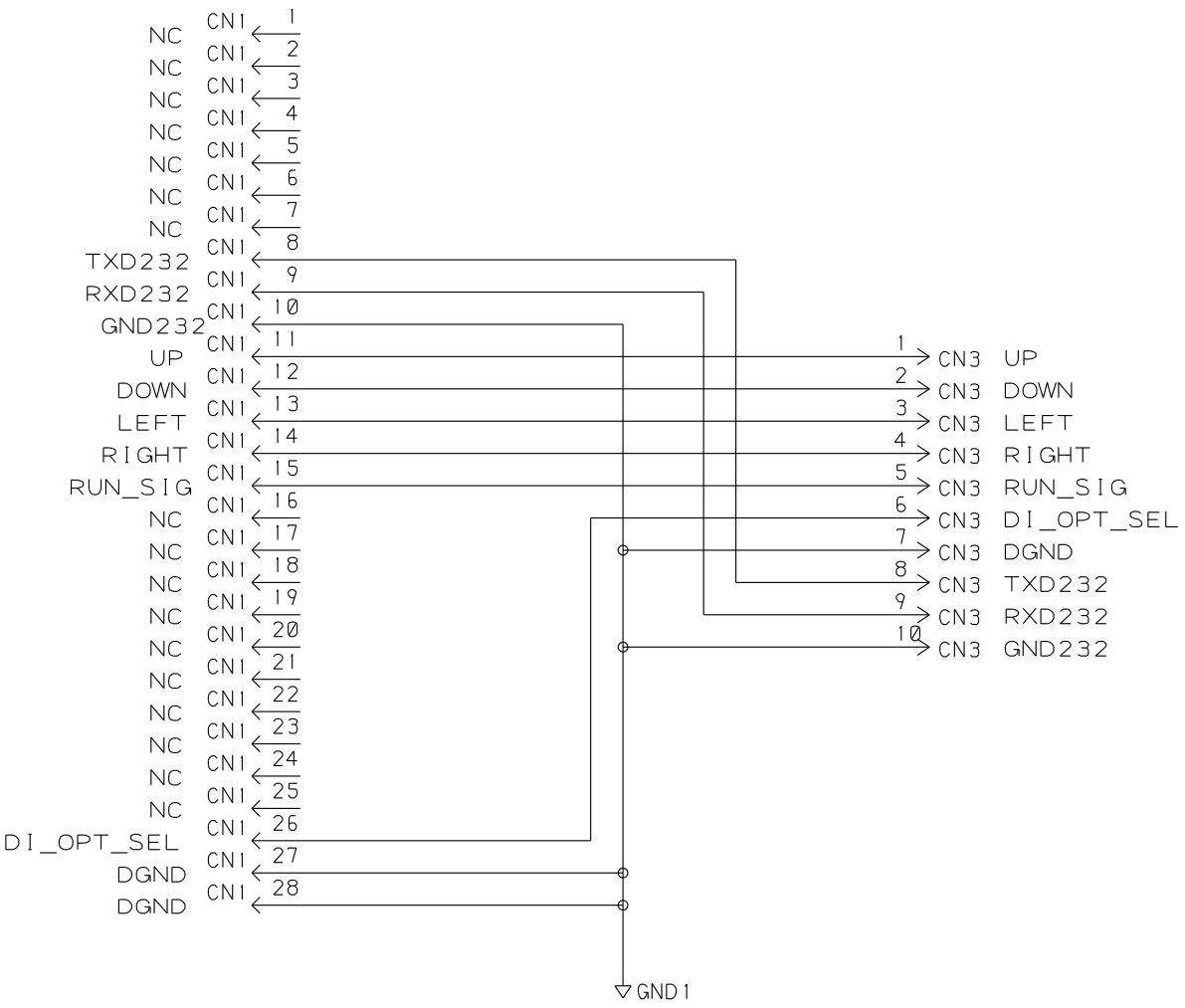
COMPONENT NAME	INTERCONNECTION	01/01
CIRCUIT BOARD NO.	DRAWING NO.	
	SCM001	

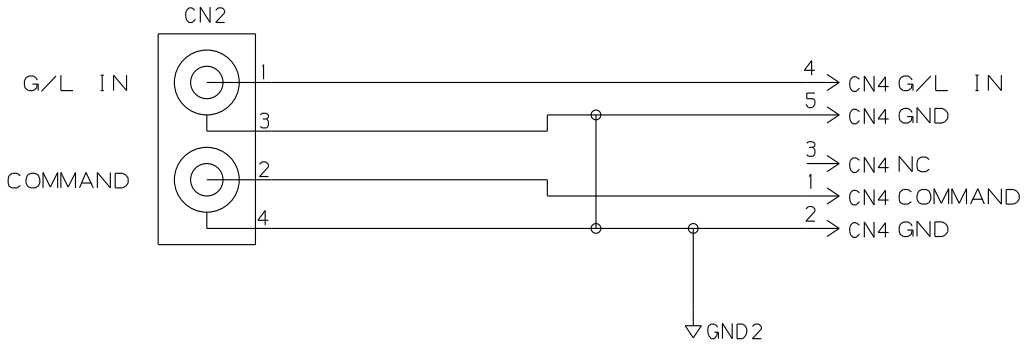


COMPONENT NAME	COMP P.C. BOARD	01/02
CIRCUIT BOARD NO.		DRAWING NO.
1A880S013		SCM002

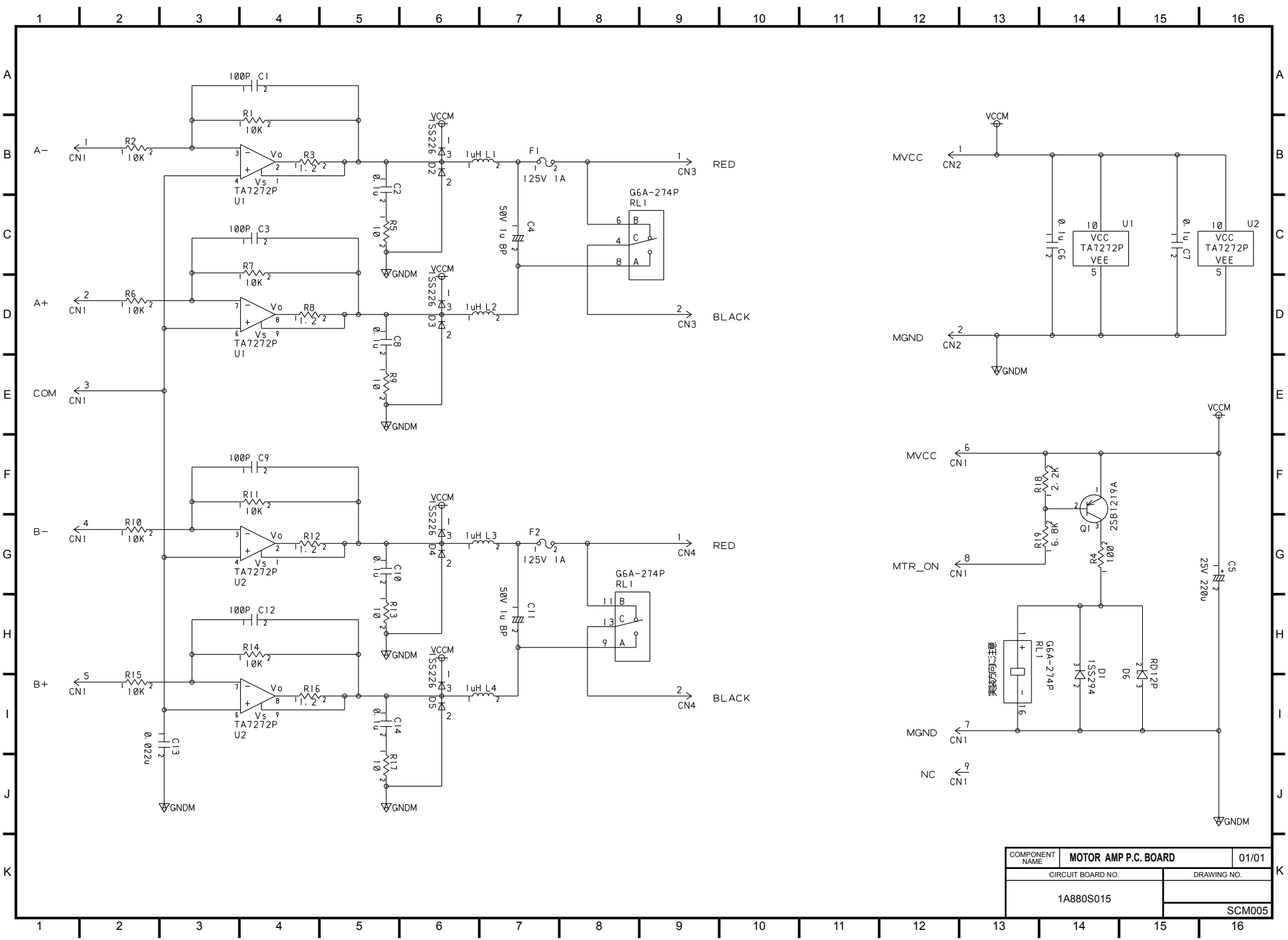


COMPONENT NAME	COMP P.C. BOARD	02/02
CIRCUIT BOARD NO.		DRAWING NO.
1A880S013		SCM003

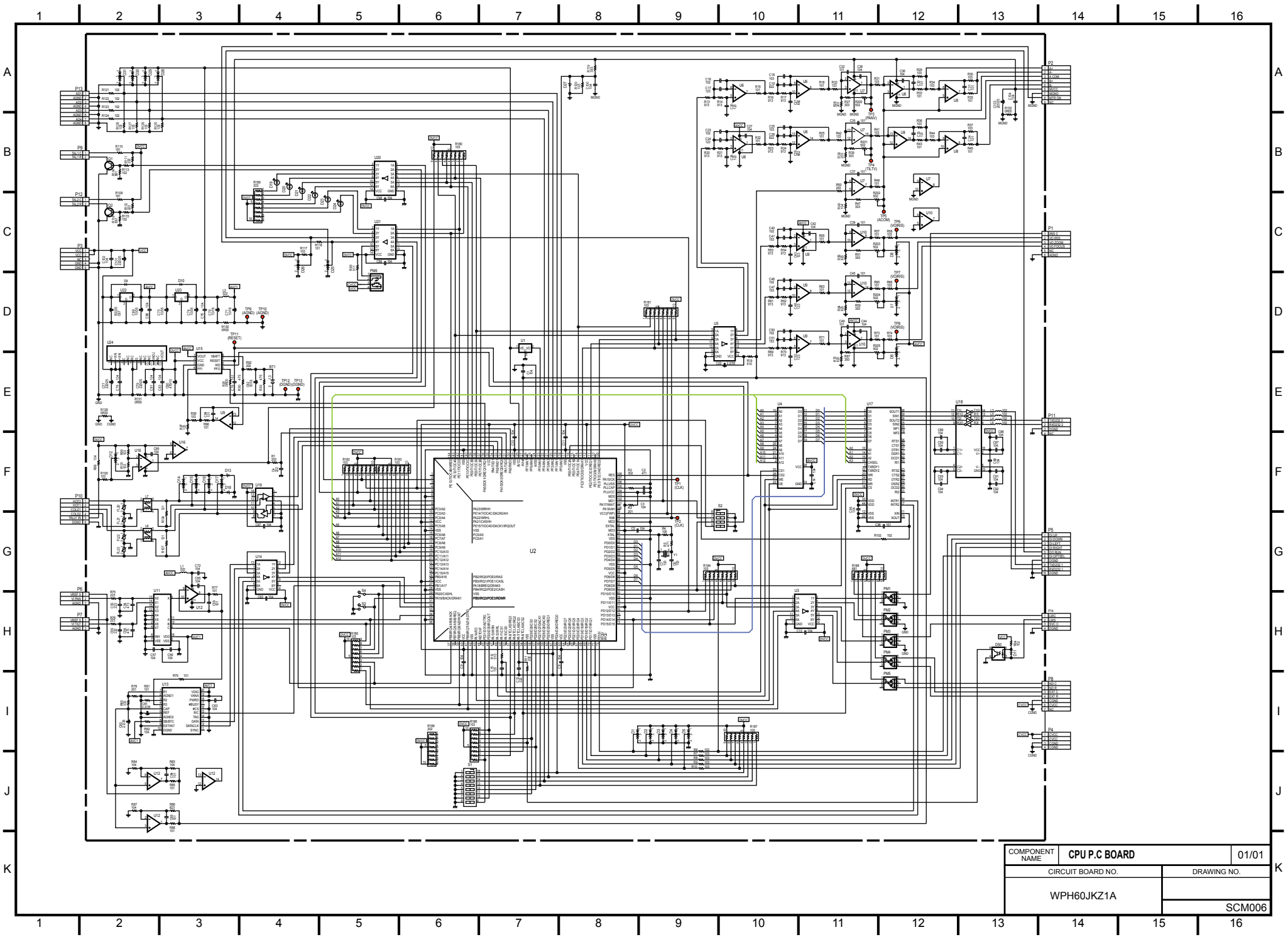




COMPONENT NAME	CON P.C. BOARD	01/01
CIRCUIT BOARD NO.		DRAWING NO.
1A880S014		SCM004



COMPONENT NAME	MOTOR AMP P.C. BOARD	01/01
CIRCUIT BOARD NO.		DRAWING NO.
1A880S015		SCM005



COMPONENT NAME	CPU P.C BOARD	01/01
CIRCUIT BOARD NO.		DRAWING NO.
WPH60JKZ1A		SCM006

SECTION 3

CIRCUIT BOARD DIAGRAMS

NOTE:
DO NOT USE THE PART NUMBER SHOWN ON THIS DRAWING FOR ORDERING. THE CORRECT PART NUMBER SHOWN IN THE PARTS LIST, AND MAY BE SLIGHTLY DIFERENT OR AMENDED SINCE THIS DRAWING WAS PREPARED.

CAUTION

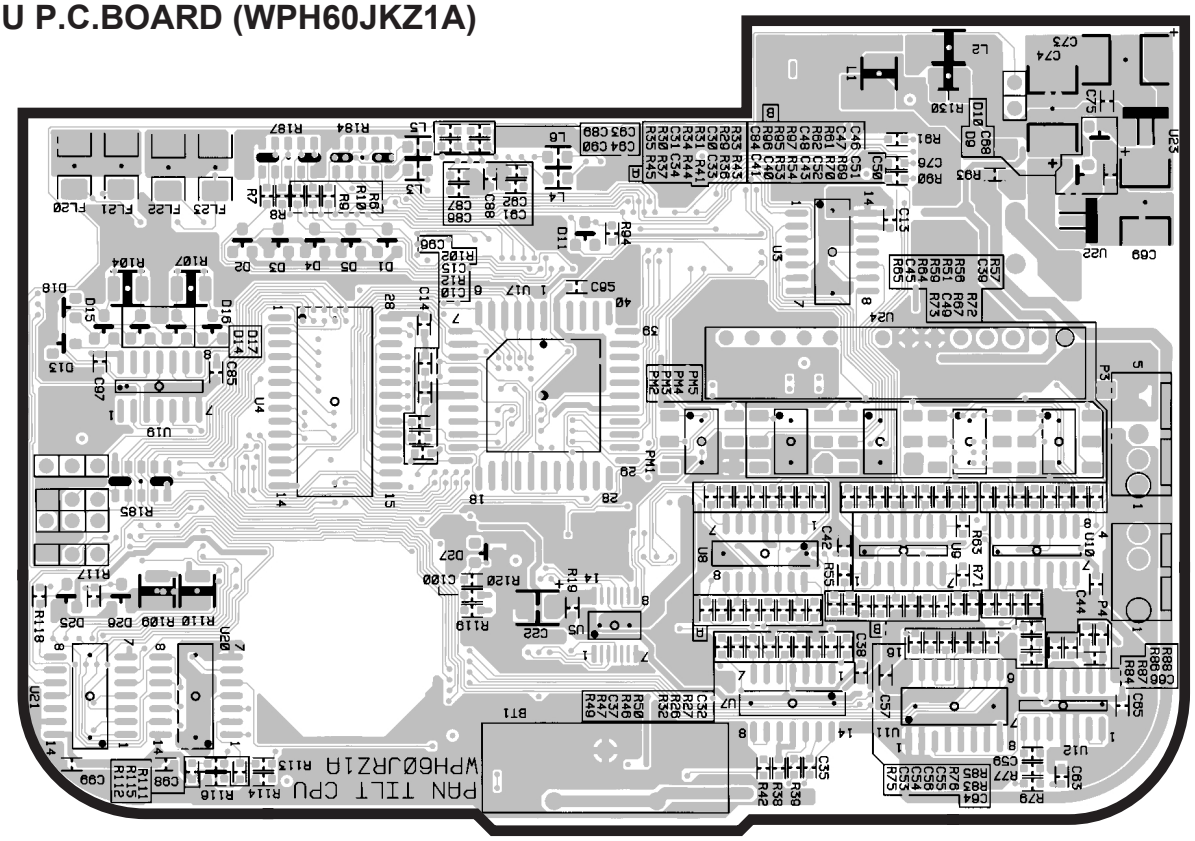
THE ▭ MARK INDICATES THE PRIMARY CIRCUIT TO DISTINGUISH THE PRIMARY FROM THE SECONDARY CIRCUIT.
PAY ATTENTION NOT TO RECEIVE AN ELECTRIC SHOCK DURING REPAIR AND SERVICE OF THE PRODUCTS.

IMPORTANT SAFETY NOTICE:
COMPONENTS IDENTIFIED WITH THE MARK ⚠ HAVE THE SPECIAL CHARACTERISTICS FOR SAFETY.
WHEN REPLACING ANY OF THESE COMPONENTS, USE ONLY THE SAME TYPE.

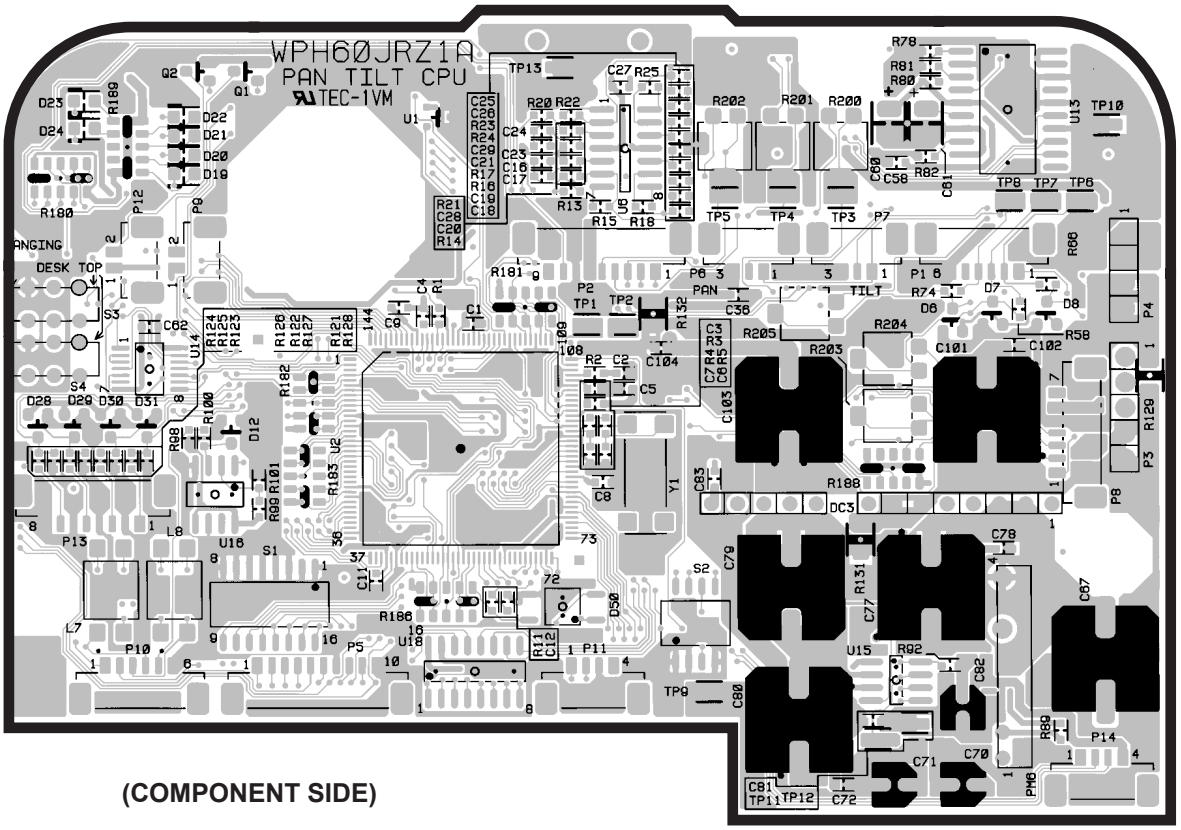
CONTENTS

CPU P.C.BOARD (WPH60JKZ1A) CBA-1
COMP P.C.BOARD (1A880S013).....CBA-2
MOTOR AMP P.C.BOARD (1A880S015) CBA-2
CON P.C.BOARD (1A880S014) CBA-2

CPU P.C.BOARD (WPH60JKZ1A)

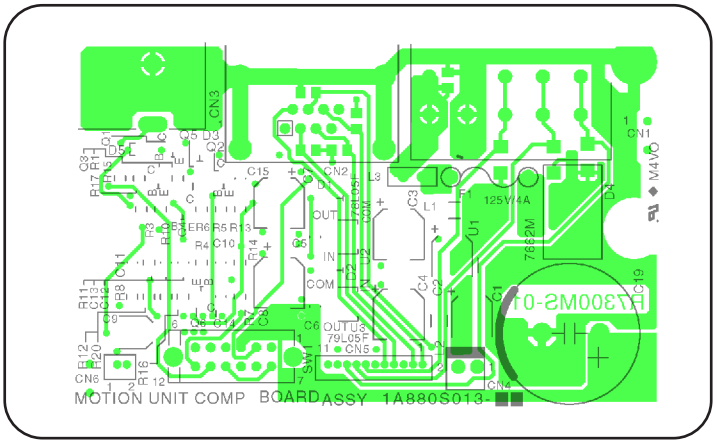


(FOIL SIDE)

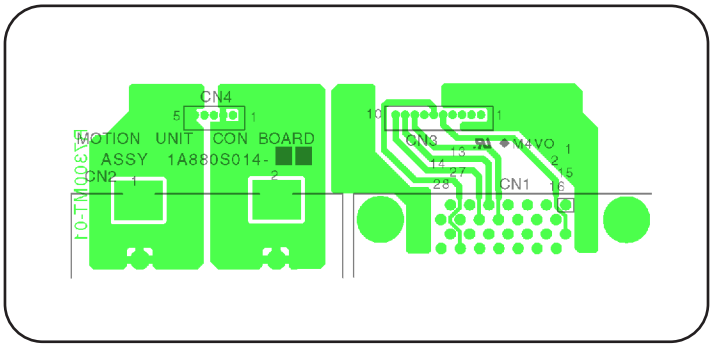


(COMPONENT SIDE)

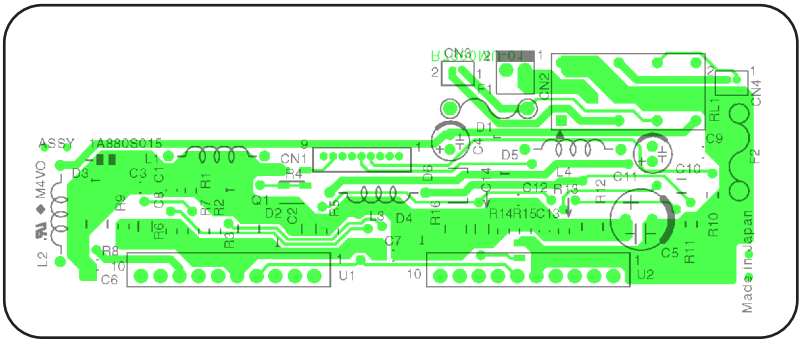
COMP P.C.BOARD (1A880S013)



CON P.C.BOARD (1A880S014)



MOTOR AMP P.C.BOARD (1A880S015)



SECTION 4

EXPLODED VIEWS
&
REPLACEMENT PARTS LIST

Note:

1. *Be sure to make your orders of replacement parts according to this list.
2. Unless otherwise specified, all resistors are in OHMS, K=1,000 OHMS, all capacitors are in MICROFARADS (μF), P=μμF.
3. The P.C. Board untils marked with "■" shown below the main assembled parts.
4. The parts marked with Ⓔ on the exploded view show the electric parts.
5. IMPORTANT SAFETY NOTICE
   Components identified with the mark ⚠ have the special characteristics for safety. When replacing any of these components, use only the same type.
6. The marking (RTL) indicates the retention time is limited for this item.
   After the diacontinuation of this assembly in production, it will no longer be available.

CONTENTS

MECHANICAL CHASSIS ASSEMBLY PRT-1
PACKING PARTS ASSEMBLY.....PRT-1
ELECTRICAL REPLACEMENT PARTS LIST PRT-3

MECHANICAL CHASSIS ASSEMBLY
PACKING PARTS ASSEMBLY

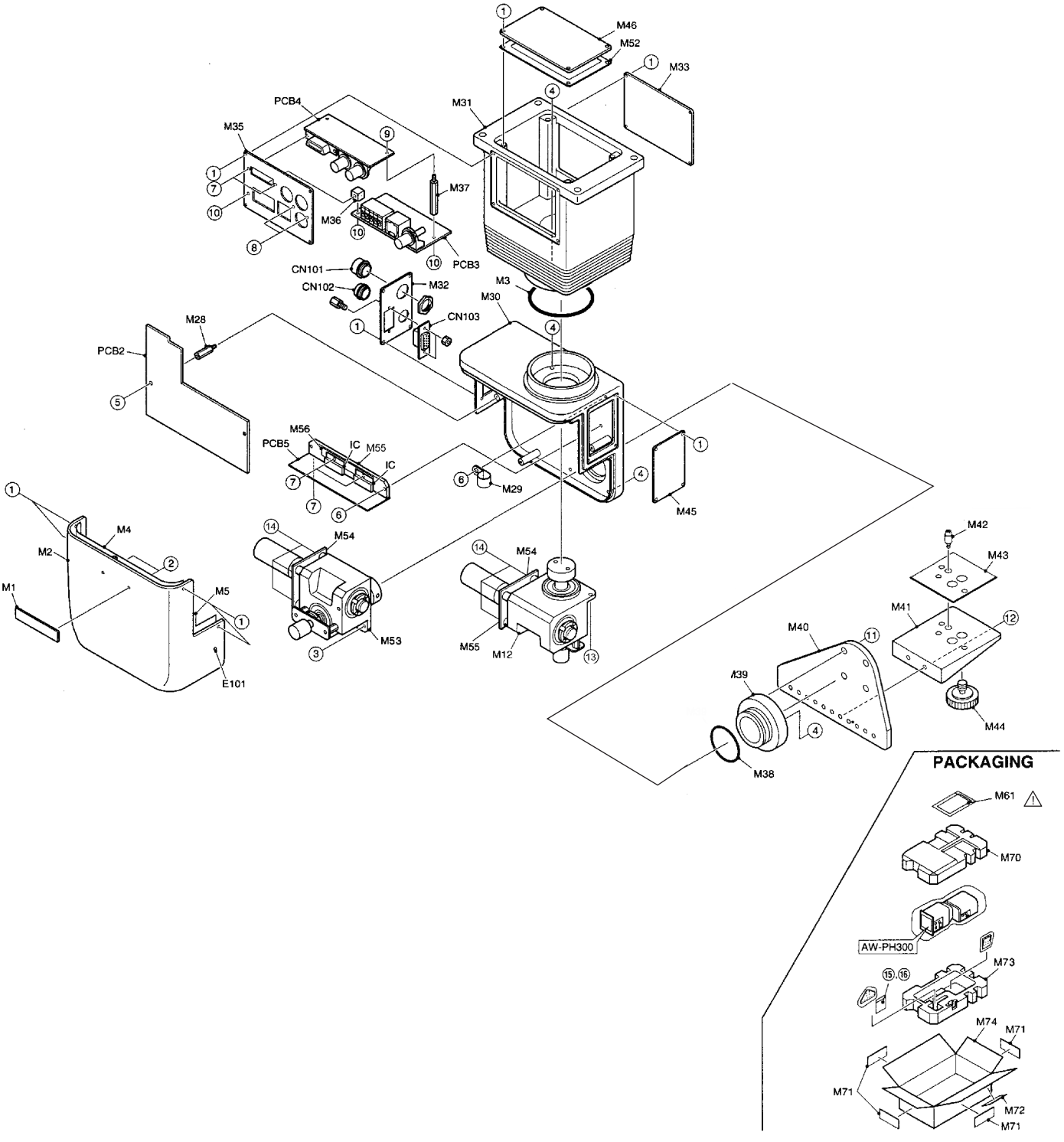
Components identified with the mark ⚠ have the special characteristics for safety.
When replacing any of these components, use only the same type.

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
M1	1A33B038-01	LOGO PLATE FOR COVER	1	
M2	1A641A226-02	COVER	1	
M4	1A405A002-01	SHEET FOR COVER	1	
M5	1A405A003-01	SHEET FOR COVER	1	
M12	1A880S020-01	GEAR HOUSING ASS'Y	1	
M28	1A108F056-06	POST FOR HEAD	1	
M29	1A108A001-04	CABLE CLAMP FOR HEAD	1	
M30	1A331A246-01	CHASSIS FOR HEAD	1	
M31	1A331A247-01	BODY FOR BASE	1	
M32	1A355L139-01	I/O PANEL FOR HEAD	1	
M33	1A355L134-01	PANEL A FOR BASE	1	
M34	1A101A608-01	O-RING FOR BODY	1	
M35	1A355L138-01	I/O PANEL FOR BASE	1	
M36	1A108F092-02	BLOCK NUT FOR BASE	1	
M37	1A108F056-28	POST FOR BASE	1	
M38	1A101A522-01	O-RING FOR FLANGE	1	
M39	1A363B041-01	FLANGE	1	
M40	1A399A346-01	PLATE	1	
M41	1A623A112-01	STAY	1	
M42	1A411A102-01	PIN FOR STAY	1	
M43	1A352B203-01	CUSHION FOR STAY	1	
M44	1A411A102-01	SCREW FOR STAY	1	
M45	1A355L136-01	PANEL C FOR HEAD	1	
M46	1A355L134-01	PANEL A FOR BASE	1	
M52	1A357A144-01	PANEL B FOR BASE	1	
M53	1A880S023-01	GEAR HEAD ASS'Y (TILT)	1	
M54	1A355C914-01	MOTOR BRACKET	1	
⚠ M61	1A880C005-10	OPERATING INSTRUCTION	1	FOR AW-PH300AP
⚠ M61	1A880C005-20	OPERATING INSTRUCTION		FOR AW-PH300AE
M70	1A334G009-01	PACKING (TOP)	1	
M71	1A337H408-01	PACKING LABEL	1	
M72	1A337H413-01	PACKING CAUTION LABEL	1	
M73	1A334G009-01	PACKING (BOTTOM)	1	
M74	1A324D095-02	PACKING CASE	1	FOR AW-PH300AP
M74	1A324D095-03	PACKING CASE	1	FOR AW-PH300AE

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
1	LB2-4	PAN HEAD SCREWS	24	
2	NM2-1	HEXAGON HEAD NUTS	2	
3	AM3X0.5-8	HEXAGON CAP SCREW	3	
4	AM3X0.5-10	HEXAGON CAP SCREW	11	
5	LB3X0.5-6	PAN HEAD SCREW	3	
6	LBWSM3-10B	PAN HEAD SCREW AND WA	4	
7	LB2.6-5	PAN HEAD SCREW	2	
8	066N406-80	BINDING HEAD SCREW	2	
9	NM3X0.5-1	HEXAGON HEAD NUT	2	
10	LB3X0.5-4	PAN HEAD SCREW	4	
11	LD4X0.7-12	BINDING HEAD SCREW	4	
12	LD4X0.7-10B	BINDING HEAD SCREW	2	
13	AM3X0.5-12	CAP SCREW	3	
14	1A108F091-02	SCREW	6	
15	1A108F093-02	SCREW	4	

Components identified with the mark⚠have the special characteristics for safety.
When replacing any of these components, use only the same type.

MECHANICAL CHASSIS ASSEMBLY
PACKING PARTS ASSEMBLY



ELECTRICAL REPLACEMENT PARTS LIST

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
	WPH60JKZ1A	CPU P.C.BOARD	1	(RTL)
	1A880S013	COMP P.C.BOARD	1	(RTL)
	1A880S015	MOTOR AMP P.C.BOARD	1	(RTL)
	1A880S014	CON P.C.BOARD	1	(RTL)
	WPH60JKZ1A	CPU P.C.BOARD	1	(RTL)
BT1	CR2032	BATTERY	1	
C1	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C2	YGM1C471J1HT	C.CAPACITOR 50V 470P	1	
C3	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C4	GRM9B222K5H	C.CAPACITOR 50V 2200P	1	
C5	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C6,C7	F1H1H100A017	C.CAPACITOR 50V 10P	2	
C8-11	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	4	
C12	GRM9B222K5H	C.CAPACITOR 50V 2200P	1	
C13,14	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	2	
C15	GRM9CH151J5H	C.CAPACITOR 150P	1	
C16	F1H1H102A190	C.CAPACITOR 50V 1000P	1	
C17	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C18	YGM1B103K1HT	C.CAPACITOR 50V 0.01U	1	
C19	F1H1H822A190	C.CAPACITOR 50V 8200P	1	
C20	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C21	F1H1H682A190	C.CAPACITOR 50V 6800P	1	
C22	SK31V225MRB	T.CAPACITOR CH 35V 2.2U	1	
C23	F1H1H102A190	C.CAPACITOR 50V 1000P	1	
C24	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C25	YGM1B103K1HT	C.CAPACITOR 50V 0.01U	1	
C26	F1H1H822A190	C.CAPACITOR 50V 8200P	1	
C27	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C28	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C29	F1H1H682A190	C.CAPACITOR 50V 6800P	1	
C30-35	GRM9CH101J5H	C.CAPACITOR 100P	6	
C36	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C37	GRM9CH101J5H	C.CAPACITOR 100P	1	
C38	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C39	GRM9CH101J5H	C.CAPACITOR 100P	1	
C40	F1H1H102A190	C.CAPACITOR 50V 1000P	1	
C41	F1H1H153A190	C.CAPACITOR 50V 0.015U	1	
C42	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C43	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C44	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C45	GRM9CH101J5H	C.CAPACITOR 100P	1	
C46	F1H1H102A190	C.CAPACITOR 50V 1000P	1	
C47	F1H1H153A190	C.CAPACITOR 50V 0.015U	1	
C48	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C49	GRM9CH101J5H	C.CAPACITOR 100P	1	
C50	F1H1H102A190	C.CAPACITOR 50V 1000P	1	
C51	F1H1H153A190	C.CAPACITOR 50V 0.015U	1	
C52	F1H1H123A190	C.CAPACITOR 50V 0.012U	1	
C53	GRM9B222K5H	C.CAPACITOR 50V 2200P	1	
C54	YGM1B473K1CT	C.CAPACITOR 50V 0.047U	1	
C55	GRM9B222K5H	C.CAPACITOR 50V 2200P	1	
C56	YGM1B473K1CT	C.CAPACITOR 50V 0.047U	1	
C57,58	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	2	
C59	GRM9CH101J5H	C.CAPACITOR 100P	1	
C60,61	SK31V225MRB	T.CAPACITOR CH 35V 2.2U	2	
C62,63	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	2	
C64	GRM9CH101J5H	C.CAPACITOR 100P	1	
C65	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
C66	GRM9CH101J5H	C.CAPACITOR 100P	1	
C67	F2G1V1010002	E.CAPACITOR 35V 100U	1	
C68	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C69	F3H1V1060004	T.CAPACITOR CH 35V 10U	1	
C70,71	VWRVS1C100M	E.CAPACITOR 16V 10U	2	
C72	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C73,74	F3H1V1060004	T.CAPACITOR CH 35V 10U	2	
C75	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C76	GRM9CH151J5H	C.CAPACITOR 150P	1	
C77	F2G1E2210003	E.CAPACITOR 25V 220U	1	
C78	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C79	F2G1E2210003	E.CAPACITOR 25V 220U	1	
C80	F2H1A4710001	E.CAPACITOR 25V 470U	1	
C81	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C82	YWRVS1C100M	E.CAPACITOR 16V 10U	1	
C83	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C84	GRM9CH151J5H	C.CAPACITOR 150P	1	
C85	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C86,87	YGM1B104Z1CT	C.CAPACITOR 16V 0.1U	2	
C88	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C89-94	YGM1B104Z1CT	C.CAPACITOR 16V 0.1U	6	
C95	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C96	GRM9CH101J5H	C.CAPACITOR 100P	1	
C97-00	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	4	
C101	F2G1E2210003	E.CAPACITOR 25 220U	1	
C102	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
C103	F2G1E2210003	E.CAPACITOR 25 220U	1	
C104	YGM1F104Z1ET	C.CAPACITOR 25V 0.1U	1	
D1-D8	B0ADDJ000003	DIODE	8	
D9-11	B0JCEE000001	DIODE	3	
D12	B0ADDJ000003	DIODE	1	
D13	B0ZBZ0000029	DIODE	1	
D14-17	B0ADDJ000003	DIODE	4	
D18	B0ZBZ0000029	DIODE	1	
D25,26	B0ADDJ000003	DIODE	2	
D27	B0BC3R600006	DIODE	1	
D28-31	B0ADDJ000003	DIODE	4	
D50	B3PBA0000048	DIODE	1	
DS19-24	TLGD1002	DIODE	6	
FL20-23	J0LB00000020	FILTER	4	
L1,L2	G1C100J00001	COIL	2	
L3-L6	J0JCC0000004	FILTER	4	
L7,L8	Z1YS51R5-2P	COIL	2	
P1	K1KA06A00086	CONNECTOR	1	
P2	K1KA09A00060	CONNECTOR	1	
P3	K1KA05A00044	CONNECTOR	1	
P4	K1KA04A00052	CONNECTOR	1	
P5	YW533981090	PLUG	1	
P6,P7	K1KA03A00063	CONNECTOR	2	
P8	K1KA07A00079	CONNECTOR	1	
P9	K1KA02A00066	CONNECTOR	1	
P10	K1KA06A00086	CONNECTOR	1	
P11	K1KA04A00073	CONNECTOR	1	
P12	K1KA02A00066	CONNECTOR	1	
P13	K1KA08A00153	CONNECTOR	1	
P14	K1KA04A00073	CONNECTOR	1	
PM1-M5	AQV212S	RELAY	5	
PM6	AQZ102	RELAY	1	
Q1,Q2	B1ABCF000031	TRANSISTOR	2	
R1	ERJ3GEYJ202	M.RESISTOR CH 1/16W 2K	1	
R2	ERJ3RHD302	M.RESISTOR CH 1/16W 3K	1	
R3	ERJ3RHD201	M.RESISTOR CH 1/16W 200	1	
R4	ERJ3GEYF105	M.RESISTOR CH 1/16W 1M	1	
R5	ERJ3RHD471	M.RESISTOR CH 1/16W 470	1	
R6-10	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	5	
R11	ERJ3GEYJ202	M.RESISTOR CH 1/16W 2K	1	
R12	ERJ3GEYJ510	M.RESISTOR CH 1/16W 51	1	

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
R13,14	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R15	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R16,17	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R18	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R19	ERJ3GEYJ510	M.RESISTOR CH 1/16W 51	1	
R20,21	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R22	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R23,24	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R25	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R26	ERJ3RHD203	M.RESISTOR CH 1/16W 20K	1	
R27	ERJ3RHD303	M.RESISTOR CH 1/16W 30K	1	
R29	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R31	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R32	ERJ3RHD123	M.RESISTOR CH 1/16W 12K	1	
R33	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R34	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R35	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R36,37	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	2	
R38	ERJ3RHD203	M.RESISTOR CH 1/16W 20K	1	
R39	ERJ3RHD303	M.RESISTOR CH 1/16W 30K	1	
R41	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R42	ERJ3RHD123	M.RESISTOR CH 1/16W 12K	1	
R43	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R44	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R45	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R46	ERJ3RHD104	M.RESISTOR CH 1/16W 100K	1	
R47	ERJ3RHD303	M.RESISTOR CH 1/16W 30K	1	
R49	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R50	ERJ3RHD243	M.RESISTOR CH 1/16W 24K	1	
R51	ERJ3RHD393	M.RESISTOR CH 1/16W 39K	1	
R53,54	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R55	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R56	ERJ3RHD623	M.RESISTOR CH 1/16W 62K	1	
R57	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R58	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	1	
R59	ERJ3RHD393	M.RESISTOR CH 1/16W 39K	1	
R61,62	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R63	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R64	ERJ3RHD623	M.RESISTOR CH 1/16W 62K	1	
R65	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R66	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	1	
R67	ERJ3RHD393	M.RESISTOR CH 1/16W 39K	1	
R69,70	ERJ3RHD913	M.RESISTOR CH 1/16W 91K	2	
R71	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R72	ERJ3RHD623	M.RESISTOR CH 1/16W 62K	1	
R73	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R74	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	1	
R75,76	ERJ3RHD223	M.RESISTOR CH 1/16W 22K	2	
R77	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R78	ERJ3RHD201	M.RESISTOR CH 1/16W 200	1	
R79	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R80	ERJ3RHD333	M.RESISTOR CH 1/16W 33K	1	
R81	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R82	ERJ3GEYJ104	M.RESISTOR CH 1/16W 100K	1	
R83,84	ERJ3RHD104	M.RESISTOR CH 1/16W 100K	2	
R85	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R86	ERJ3RHD823	M.RESISTOR CH 1/16W 82K	1	
R87	ERJ3RHD104	M.RESISTOR CH 1/16W 100K	1	
R88	ERJ3RHD101	M.RESISTOR CH 1/16W 100	1	
R89	ERJ3GEYJ511	M.RESISTOR CH 1/16W 510	1	
R90	ERJ3GEYJ475	M.RESISTOR CH 1/16W 4.7M	1	
R91	ERJ3GEY0R00	M.RESISTOR CH 1/16W 0	1	
R92	ERJ3GEYJ202	M.RESISTOR CH 1/16W 2K	1	
R93	ERJ3GEYJ475	M.RESISTOR CH 1/16W 4.7M	1	
R94	ERJ3GEYG102	M.RESISTOR CH 1/16W 1K	1	
R95	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	1	
R96	ERJ3GEYJ101	M.RESISTOR CH 1/16W 100	1	
R97	ERJ3GEYJ123	M.RESISTOR CH 1/16W 12K	1	
R98	ERJ3GEYJ104	M.RESISTOR CH 1/16W 100K	1	
R99-01	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	3	
R102	ERJ3GEYG102	M.RESISTOR CH 1/16W 1K	1	
R104	ERJ14YJ121	M.RESISTOR CH 1/4W 120	1	
R107	ERJ14YJ121	M.RESISTOR CH 1/4W 120	1	
R109,10	ERJ14YJ181	M.RESISTOR CH 1/4W 180	2	
R111,12	ERJ3GEYJ222	M.RESISTOR CH 1/16W 2.2K	2	

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
R113	ERJ3GEYG102	M.RESISTOR CH 1/16W 1K	1	
R114	ERJ3GEYJ681	M.RESISTOR CH 1/16W 680	1	
R115	ERJ3GEYG102	M.RESISTOR CH 1/16W 1K	1	
R116	ERJ3GEYJ681	M.RESISTOR CH 1/16W 680	1	
R117	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	1	
R118	ERJ3GEYJ101	M.RESISTOR CH 1/16W 100	1	
R119	ERJ3RHD393V	M.RESISTOR CH 1/16W 39K	1	
R120	ERJ3RHD103	M.RESISTOR CH 1/16W 10K	1	
R121-24	ERJ3GEYG102	M.RESISTOR CH 1/16W 1K	4	
R125-28	ERJ3GEYJ103	M.RESISTOR CH 1/16W 10K	4	
R129-32	ERJ8GEY0R00	M.RESISTOR CH 1/8W 0	4	
R180-87	D1HA10380003	C.RESISTOR 1/16W 10K	8	
R188	D1HA68180001	C.RESISTOR 1/16W 680	1	
R189	D1HA22280002	C.RESISTOR 1/16W 2.2K	1	
R200-05	D3EC45020006	V.RESISTOR 1/4W 5K	6	
S1	YWCHS08B	SWITCH	1	
S2	YWCHS04TB	SWITCH	1	
S3,S4	K0D126A00001	SWITCH	2	
TP1-13	YWRCT2125TPV	TERMINAL PIN	13	
U1	C1ZBZ0001200	IC	1	
U2	C2DBKG000002	IC	1	
U3	YWSN74LS07NS	IC	1	
U4	YWHM6264BLFP	IC	1	
U5	C0JBAB000196	IC	1	
U6	LMC6484IM	IC	1	
U7,U8	C0ABCB000021	IC	2	
U9,10	LMC6484IM	IC	2	
U11	YW,C14051BF	IC	1	
U12	LMC6484IM	IC	1	
U13	C0FBAH000004	IC	1	
U14	C0JBAB000196	IC	1	
U15	C0EBJ0000043	IC	1	
U16	C0BBBB000006	IC	1	
U17	C1DZ00000005	IC	1	
U18	C1DB00000294	IC	1	
U19	C1DB00000295	IC	1	
U20	C0JBCZ000137	IC	1	
U21	YWSN74LS07NS	IC	1	
U22	C0CBAHA00002	IC	1	
U23	YW78L05UATE2	IC	1	
U24	HRD050R6	IC	1	
X1	BCR20V4	HOLDER	1	
Y1	H0J600400003	CRYSTAL OSCILLATOR	1	
	1A880S013	COMP P.C.BOARD	1	(RTL)
C1,C2	YWRVS1E100M	E.CAPACITOR 25V 10U	2	
C3,C4	RV2J1E330M	E.CAPACITOR 25V 33U	2	
C5,C6	YGM2F104Z1HT	C.CAPACITOR 50V 0.1U	2	
C7,C8	RV2J1E330M	E.CAPACITOR 25V 33U	2	
C9	YWRVS1E4R7M	E.CAPACITOR 25V 4.7U	1	
C10	GRM0CJ030C5H	C.CAPACITOR 50V 3P	1	
C11	GRM40CH360J5	C.CAPACITOR 50V 36P	1	
C12	GRM0CH080D5H	C.CAPACITOR 50V 8P	1	
C13	GRM0CH470J5H	C.CAPACITOR 50V 47P	1	
C14,15	YGM2F104Z1HT	C.CAPACITOR 50V 0.1U	2	
C16-18	YR32F104Z1HB	C.CAPACITOR 50V 0.1U	3	
C19	ECA1CHG103	E.CAPACITOR 16V 0.01U	1	
CN1	ML800S1H5P	TERMINAL	1	
CN2	K2LC108B0005	CONNECTOR	1	
CN3	K1AB102B0001	CONNECTOR	1	
CN4	K1KA02A00045	CONNECTOR	1	
CN5	K1KA11A00022	CONNECTOR	1	
CN6	K1KA02A00060	CONNECTOR	1	

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
D1,D2	MA142K	DIODE	2	
D3	MA143A	DIODE	1	
D4	B0FCAE000001	DIODE	1	
D5	MA111	DIODE	1	
F1	473004	FUSE	1	
L1,L2	G1C100J00001	COIL	2	
L3	J0JHB0000008	COIL	1	
Q1	2SC3931-C	TRANSISTOR	1	
Q2	2SD1820A	TRANSISTOR	1	
Q3,Q4	2SC3931-C	TRANSISTOR	2	
Q5	XP4601	TRANSISTOR	1	
Q6	2SB1219A	TRANSISTOR	1	
R1	ERJ6ENF6801	M.RESISTOR CH 1/10W 6.8K	1	
R2	ERJ6GEY0R00	M.RESISTOR CH 1/10W 0	1	
R3	ERJ6ENF1000	M.RESISTOR CH 1/10W 10	1	
R4	ERJ6ENF2201	M.RESISTOR CH 1/10W 2.2K	1	
R5,R6	ERJ6ENF10R0	M.RESISTOR CH 1/10W 10	2	
R7,R8	ERJ6ENF75R0	M.RESISTOR CH 1/10W 75	2	
R10	ERJ6ENF6801	M.RESISTOR CH 1/10W 6.8K	1	
R11	ERJ6ENF1201	M.RESISTOR CH 1/10W 1.2K	1	
R12	ERJ6ENF5101	M.RESISTOR CH 1/10W 5.1K	1	
R13,14	ERJ6ENF10R0	M.RESISTOR CH 1/10W 10	2	
R15	ERJ6GEY0R00	M.RESISTOR CH 1/10W 0	1	
R16	ERJ6ENF1301	M.RESISTOR CH 1/10W 1.3K	1	
R17	ERJ6ENF6801	M.RESISTOR CH 1/10W 6.8K	1	
R20	ERJ6ENF1002	M.RESISTOR CH 1/10W 10K	1	
SW1	SSSF042P6N	SWITCH	1	
U1	NJU7662M	IC	1	
U2	TA78L05F	IC	1	
U3	NJM79L05UA	IC	1	
	1A880S015	MOTOR AMP P.C.BOARD	1	(RTL)
C1	RPE131CH101J	C.CAPACITOR 50V 100P	1	
C2	ECQE1104KF	P.CAPACITOR 63V 0.1U	1	
C3	RPE131CH101J	C.CAPACITOR 50V 100P	1	
C4	ECA1HM010	E.CAPACITOR 50V 1U	1	
C5	EEUGA1E221	E.CAPACITOR 25V 220U	1	
C6,C7	RPE131F104Z5	E.CAPACITOR 50V 0.1U	2	
C8	ECQE1104KF	P.CAPACITOR 63V 0.1U	1	
C9	RPE131CH101J	C.CAPACITOR 50V 100P	1	
C10	ECQE1104KF	P.CAPACITOR 63V 0.1U	1	
C11	ECA1HM010	E.CAPACITOR 50V 1U	1	
C12	RPE131CH101J	C.CAPACITOR 50V 100P	1	
C13	GRM40R223K50	C.CAPACITOR 50V 0.022U	1	
C14	ECQE1104KF	P.CAPACITOR 63V 0.1U	1	
CN1	K1KA09A00038	CONNECTOR	1	
CN2	K1KA02A00045	CONNECTOR	1	
CN3,N4	K1KA02A00060	CONNECTOR	2	
D1	B0JCEE000001	DIODE	1	
D2-D5	B0ADDJ000002	DIODE	4	
D6	B0BA01200044	DIODE	1	
F1,F2	K5Y102A00001	FUSE	2	
L1-L4	G0C2R2K00006	COIL	4	
Q1	2SB1219A	TRANSISTOR	1	
R1,R2	ER025CKF1002	M.RESISTOR 1/4W 10K	2	
R3	ERX12SJ1R2	M.RESISTOR 1/2W 1.2	1	

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
R4	RK73H23H100	M.RESISTOR 10	1	
R5	ER025CKF10R0	M.RESISTOR 1/4W 10	1	
R6,R7	ER025CKF1002	M.RESISTOR 1/4W 10K	2	
R8	ERX12SJ1R2	M.RESISTOR 1/2W 1.2	1	
R9	ER025CKF10R0	M.RESISTOR 1/4W 10	1	
R10,11	ER025CKF1002	M.RESISTOR 1/4W 10K	2	
R12	ERX12SJ1R2	M.RESISTOR 1/2W 1.2	1	
R13	ER025CKF10R0	M.RESISTOR 1/4W 10	1	
R14,15	ER025CKF1002	M.RESISTOR 1/4W 10K	2	
R16	ERX12SJ1R2	M.RESISTOR 1/2W 1.2	1	
R17	ER025CKF10R0	M.RESISTOR 1/4W 10	1	
RL1	G6A-274P12V	RELAY	1	
U1	TA7272P	IC	1	
		MISCELLANEOUS		
	1A355H283-01	PLATE	1	
	1A355H284-01	PLATE	1	
	STDLB2.6-5	SCREW	4	
	1A880S014	CON P.C.BOARD	1	(RTL)
CN1	K1FB128B0002	CONNECTOR	1	
CN2	P2183-B	CONNECTOR	1	
CN3	K1KA10A00067	CONNECTOR	1	
CN4	K1KA05A00059	CONNECTOR	1	

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